SOIL SURVEY

Mitchell County North Carolina

Series 1939, No. 14

Issued January 1952

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils, and Agricultural Engineering
In cooperation with the
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
and the
TENNESSEE VALLEY AUTHORITY

How to Use THE SOIL SURVEY REPORT

FARMERS who have lived in one locality for a long time come to know about the soil differences on their own farms and on those of their immediate neighbors. What they do not know, unless a soil survey has been made, is how nearly their soils are like those at experiment stations or in other localities from which higher yields are reported. They do not know whether these higher yields are from soils like their own or so different that they could not hope to get equally high returns, even if they adopted the practices followed in these other places. These similarities and differences among soils are known only after a map of the soils has been made. Knowing what kind of soil one has and comparing it with soils on which new developments have proved successful will remove some of the risk in trying new methods and varieties.

SOILS OF A PARTICULAR FARM

To find what soils are on any farm or land, locate the tract on the soil map, which is in the envelope inside the back cover. This is easily done by finding the locality the farm is known to be in and locating its boundaries by such landmarks as roads, streams, villages, and other features.

Each kind of soil is marked with a symbol on the map: For example, all areas marked Ss are of the same soil. To find the name of the soil so marked, look at the legend printed near the margin of the map and find Ss. The color where Ss appears in the legend will be the same as where it appears on the map. The Ss means State silt loam. A section of this report (see table of contents) tells what State silt loam is like, for what it is mainly used, and some of the uses to which it is suited.

How productive is State silt loam? Find this soil name in the left-hand column of table 12, and note the yields of the different crops opposite it. This table also gives expectable yields for all the other soils mapped, so that the different soils may be compared.

Read in the section on Soil Types and Phases to learn what are good uses and management practices for this soil. Look also at the section headed Use, Management, and Productivity of the Soils. Here soils suited to about the same use and management practices are grouped. Find the group (see table 9) that contains State silt loam and see what is said there about suitable crops, rotations, liming, fertilizing, and water control.

SOILS OF THE COUNTY AS A WHOLE

If a general idea of the soils of the county is wanted, read the section on General Nature of the Soils. This tells where the principal kinds are found, what they are like, and how they are related to one another. Then study the soil map and notice how the different kinds of soils tend to be arranged in different localities. These patterns are likely to be associated with well-recognized differences in type of farming and land use.

A newcomer who considers purchasing a farm in the county will want to know about the climate as well as the soils; the types and sizes of farms; the principal farm products and how they are marketed; the kinds of farm tenure; availability of schools, churches, highways, railroads, telephone and electric services, and water supplies; industries; and towns and population characteristics. This information will be found in the sections on General Nature of the Area and on Agriculture.

Students and others interested in how the soils of the county were formed and how they are related to the great soil groups of the world should read the section on Morphology and Genesis of Soils.

This publication on the soil survey of Mitchell County, N. C., is a cooperative contribution from the—

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Series 1939, No. 14 Issued January 1952

SOIL SURVEY OF MITCHELL COUNTY, NORTH CAROLINA[1]

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United States Department of Agriculture in cooperation with the North Carolina Agricultural Experiment Station and the Tennessee Valley Authority

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[1] This report was revised by members of the Agronomy Department, North Carolina Agricultural Experiment Station, 1945.

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SITUATED in the western part of North Carolina in the Blue Ridge Mountains, Mitchell County varies in relief from low intermountain uplands to elevated mountain plateaus and from rolling hills to high rugged mountains. Most of the land suitable for agriculture has been cleared. Cabbage, snap beans, potatoes, and tobacco are the principal cash crops, and corn, wheat, rye, oats, hay, and forage are grown as subsistence crops. Because of its steepness and susceptibility to erosion, however, much of the land is not suitable for tilled crops and could not supply an adequate livelihood for the present population without the timber and mining industries. The many streams furnish an abundant water supply for livestock, and some livestock products are sold or traded. The mining of kyanite, kaolin clay, mica, feldspar, and quartz furnishes additional employment. Emeralds, asbestos, iron ore, and marble are also mined in the county. To provide a basis for the best agricultural uses of the land a cooperative research was planned. Mapping the soil was begun in 1939 by the United States Department of Agriculture, the North Carolina Agricultural Experiment Station, and the Tennessee Valley Authority.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

Mitchell County covers 220 square miles, or 140,800 acres, in the western part of North Carolina (fig. 1). The county line follows along streams or the crests of winding mountain ridges and borders Tennessee on the northwest. Bakersville, the county seat, is 45 miles northeast of Asheville, 90 miles northwest of Charlotte, and 195 miles west of Raleigh.

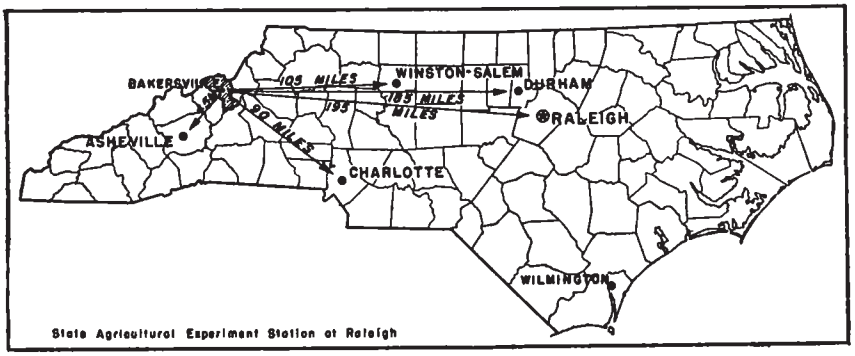


FIGURE 1.—Location of Mitchell County in North Carolina.

PHYSIOGRAPHY, RELIEF, AND DRAINAGE

The county lies in the Blue Ridge physiographic province, a division of the Appalachian Highlands. The relief is rolling, hilly, and mountainous. The mountains, in general, have sharp crests, steep slopes, and spurs extending in all directions. In some places near the base of the mountains and in coves the relief is fairly smooth, but these areas are small and scattered. Along the streams are strips or small bodies of almost level bottom land that range in width from a few feet to about 400. Most of these are subject to overflow.

Elevations above sea level vary widely. The highest point, Roan High Knob, is 6,285 feet, and the lowest, where the Nolichucky River flows into Tennessee, 1,769 feet. The heights [2] of some of the better known mountains are Bald, 6,134 feet; Round Bald, 5,826; Jane Bald, 5,807; Little Yellow, 5,504; Beartown, 5,481; and Spear Tops, 4,852. Elevations of towns are Buladean, 2,761 feet; Spruce Pine, 2,518; and Bakersville, 2,460.

The North Toe (pl. 1) and the Nolichucky Rivers and their tributaries drain all the county. These streams flow to the west and northwest and join near Huntdale, the waters eventually reaching the Mississippi River. The surface drainage is good, but in some nearly level areas in first bottoms drainage is poor. Rivers, creeks, branches, and small drainageways extend to all parts of the county, giving the uplands complete surface drainage.

GEOLOGY

Most of the geologic formations in Mitchell County belong to the Cambrian era. The oldest of these is the Carolina gneiss, followed by Roan gneiss, the Unicoi formation, and Cranberry granite. There are a few small dikes of diorite and gabbro, classed as Bakersville gabbro, in scattered spots.

Carolina gneiss (*10*)[3] occurs chiefly in the southern part of the county. The formation consists of a series of interbedded mica schist, garnet schist, and fine-grained granitoid layers. Most of these are light gray, weathering on exposure to dull greenish gray. Roan gneiss (*10*) occurs chiefly in the north-central part of the county, adjoining the Cranberry granite. It consists of interbedded mica schist

[2] Data obtained from Coast and Geodetic Survey, U. S. Department of Commerce.
[3] Italic numbers in parentheses refer to Literature Cited, p. 85.

and mica gneiss. The hornblendic beds are dark green to black and the micaceous beds are dark gray. The Unicoi formation (*9*) is found only in the northwestern part. It is sedimentary in origin and consists of sandstone, conglomerate, and quartzite, which are light gray or white and weather to medium or light gray. Cranberry granite (*9*) is found in the northern part of the county. The formation consists of granite of varying texture and color and of schist and granitoid gneiss derived from granite.

The chief minerals mined in the county are mica (*3*), feldspar, kaolin, and quartz. Asbestos occurs in fairly large quantities near Ledger and Bakersville, and emeralds have been found at a number of places on Crabtree Mountain. In the northern end of the county there are large deposits of magnetic iron ore. A deposit of dolomitic marble occurs on the north bank of the North Toe River. Near Bakersville are lenses of kyanite schist having 15 to 40 percent of kyanite; kaolin clay is found between Spruce Pine and Penland. Some of the most important mica, feldspar, and kaolin mines in the State occur in a belt several miles wide, which crosses the central part of the county (*4*, *5*).

CLIMATE

The climate of Mitchell County is influenced by the high altitudes. During the moderately short summers the nights are cool and the days are never sultry or very hot. The winters are generally cold but not severe, although short erratic spells of very cold weather are to be expected. Rainfall is plentiful, being well distributed throughout the growing season as well as the entire year. Locally, wide variations exist in the mean annual temperature and precipitation because of the great differences in elevation. On the higher mountains the precipitation is much heavier and the temperature considerably lower than in the valley areas. Snow remains on some of the more elevated northern slopes during much of midwinter. Cover crops—as wheat, rye, and crimson clover—and a few hardy vegetables may be grown in winter at elevations below 3,200 feet. Outdoor work can be performed most of the winter.

There is no United States Weather Bureau station in the county, but the average frost-free period for the highest elevations is probably similar to that on Mount Mitchell, Yancey County, or 133 days, and the average frost-free period for the rest of the county more nearly equals that at Montreat, Buncombe County, or 176 days. Killing frost has come as late as June 30 and as early as September 6 at Mount Mitchell and as late as May 24 and as early as September 22 at Montreat.

The average number of clear days in the county is 120 (*7*), and of cloudy days, 110. The annual average number of days with snow cover is 30. There are 30 days with dense fog, thunderstorms on about 50 days, and local hailstorms about once or twice a year. The occasional periods of drought are seldom severe.

The normal monthly, seasonal, and annual temperature and precipitation at Mount Mitchell, Yancey County, which has a climate similar to the highest elevations, and at Montreat, Buncombe County, which compares closely in climate with the valley parts of Mitchell County, are compiled from the United States Weather Bureau records and given in table 1.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Montreat, Buncombe County, N. C., and Mount Mitchell, Yancey County, N. C.*

MONTREAT, BUNCOMBE COUNTY, ELEVATION 2,600 FEET

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total for the driest year	Total for the wettest year	Average snowfall
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December	39. 6	81	−14	4. 80	1. 37	2. 11	2. 5
January	38. 5	75	−7	3. 90	4. 05	3. 58	4. 5
February	40. 2	80	−4	4. 50	1. 98	6. 06	2. 3
Winter	39. 4	81	−14	13. 20	7. 40	11 75	9. 3
March	45. 8	87	2	5. 20	2. 98	8. 24	2. 4
April	53. 6	90	12	4. 50	3. 64	3. 38	. 1
May	61. 0	95	28	5. 00	2. 71	5. 67	[1]
Spring	53. 5	95	2	14. 70	9. 33	17. 29	2. 5
June	68. 3	96	38	5. 40	1. 94	4. 51	0
July	70. 0	103	44	5. 70	4. 26	4. 33	0
August	69. 8	97	43	5. 10	1. 22	2. 65	0
Summer	69. 4	103	38	16. 20	7. 42	11. 49	0
September	65. 9	98	30	5. 20	3. 74	13. 68	0
October	56. 0	86	19	4. 20	3. 70	8. 93	[1]
November	46. 3	78	1	2. 60	3. 90	4. 63	. 1
Fall	56. 1	98	1	12. 00	11. 34	27. 24	. 1
Year	54. 6	103	−14	56. 10	[2] 35. 49	[3] 67. 77	11. 9

MOUNT MITCHELL, YANCEY COUNTY, ELEVATION 6,684 FEET

December	28. 4	57	−13	4. 70	3. 16	3. 60	10. 9
January	27. 6	58	−18	5. 16	4. 86	2. 85	9. 3
February	27. 9	58	−17	4. 25	2. 82	4. 05	16. 3
Winter	28. 0	58	−18	14. 11	10. 84	10. 50	36. 5
March	31. 4	74	−14	6. 62	4. 64	10. 35	18. 3
April	40. 2	72	−1	5. 45	5. 80	6. 17	4. 5
May	49. 3	77	17	5. 56	5. 05	5. 47	1. 2
Spring	40. 3	77	−14	17. 63	15. 49	21. 99	24. 0
June	55. 7	80	28	4. 74	6. 91	12. 82	0
July	59. 3	87	36	7. 00	7. 79	9. 04	0
August	58. 4	79	35	7. 71	. 97	5. 33	0
Summer	57. 8	87	28	19. 45	15. 67	27. 19	0
September	55. 2	81	24	6. 49	3. 59	7. 94	0
October	45. 0	72	9	5. 42	1. 53	7. 11	1. 2
November	35. 7	67	−21	6. 09	2. 73	13. 10	2. 7
Fall	45. 3	81	−21	18. 00	7. 85	28. 15	3. 9
Year	42. 9	87	−21	69. 19	[4] 49. 85	[5] 87. 83	64. 4

[1] Trace. [2] In 1925. [3] In 1929. [4] In 1943. [5] In 1934.

WATER SUPPLY

Excellent water for domestic use is available from springs on nearly every farm. Well water is obtainable at depths of 80 feet or less. The many streams furnish an abundant supply of water for livestock, and many of them have been stocked with game fish. On the Nolichucky River it is estimated that up to 38,900 hydro-electric horsepower could be developed. The Carolina Power & Light Company has a 60,000-volt transmission line on the North Toe River serving Spruce Pine and the southern part of the county.

VEGETATION

The original tree growth was chestnut, oak, hemlock, balsam, yellow-poplar (tuliptree), beech, birch, hickory, black walnut sourwood, buckeye, and dogwood. Beneath the forest was a growth of shrubs and other small plants consisting chiefly of rhododendron, mountain-laurel, huckleberry, and buckberry. Galax and trailing-arbutus were common plants on the mountains. A good growth of grass was on a few small balds or other open or sparsely wooded areas.

A large part of the original tree growth has been cut for timber, and yellow-poplar, oak, maple, black locust, pine, birch, and hickory have come in as second and third growth. Pine and black locust are more common in the present wooded areas than in the original forest. Cultivated lands not used or abandoned soon grow up in weeds, broomsedge, and briers. Within 3 or 4 years white and shortleaf pines, black locust, or yellow-poplar trees begin to appear. The growth is rapid except on severely eroded areas, and a good stand is usually made within a few years. Recently much of the abandoned land, especially the severely eroded and gullied areas, has been reforested.

ORGANIZATION AND POPULATION

The Cherokee Indians were in possession of the territory now making up Mitchell County when the first white settlers came to the area. The first settlers were mostly of English and Scotch descent and came largely from South Carolina and the Piedmont section of North Carolina. Those who came as early as 1777, when the area was part of Burke County, settled in the coves in the intermountain areas. In 1861 the county was formed from Yancey, Watauga, Caldwell, Burke, and McDowell Counties (*10*) and named in honor of Dr. Elisha Mitchell.

The present population is made up principally of descendants of the early settlers, but a part consists of people who have moved in from nearby points in Tennessee and from other parts of North Carolina. Most of the population of 15,980 reported in the 1940 census is concentrated in the towns and villages and in the best farming sections. The density of only 72.6 persons a square mile still classes the county as rural.

Spruce Pine (population 1,968) is the principal town and the chief trading center within the county. In 1940 Bakersville had a population of 437. Other villages or communities and their populations are Buladean, 450; Little Switzerland, 163; Glen Ayre, 125; Hawk, 90; Tipton Hill, 45; and Red Hill, 20. These are local trading points

for farm products. Wing Station, Toecane, Altapass, Bandana Station, Huntdale, Relief, and Poplar are shipping points located on the railroad.

INDUSTRIES

Considerable income is derived from the mining of feldspar, mica, kaolin, and quartz. Feldspar and mica are sold as they come from the mine or are graded, cut, and ground to the extent called for by the quality of the material.

Harvesting and preparation of forest products—including saw timber, tanbark, acid wood, and pulpwood—has long been a major enterprise, carried on largely during the fall and winter. In 1939 (*3*) the estimated stand of timber was 70 million board feet of saw timber, most of which is fairly accessible by road. The forest area totaled 82,875 acres, of which 34,982 acres were on farms. In 1941 (*8*) there were 27 sawmills in the county.

TRANSPORTATION AND MARKETS

The main line of the Carolina, Clinchfield, & Ohio Railroad furnishes transportation for the southern part of the county. The rural sections of the rest of the county are within fairly easy reach of shipping points by means of good highways. United States Highway No. 19E from Asheville to Boone crosses the county from west to east, and there is a hard-surfaced road from Red Hill through Bakersville and Spruce Pine to Little Switzerland. State highways connect Tennessee and United States Route No. 19 by crossing the western part of the county. Good gravel roads branch out from Bakersville and Spruce Pine and serve all important rural sections. Most of these routes are open for travel throughout the winter and provide means for transporting farm products from the county to larger markets. The other public roads are good in summer and fall but some are impassable in winter, except for light cars and horse-drawn vehicles. Roads or trails extend into all communities.

The towns and villages are local distributing points for supplies, but Spruce Pine and Bakersville afford the only local markets for agricultural products. Most of the produce is brought in by farmers or by peddlers. Many of the farm products, as livestock, milk, and forest products, are sold in Asheville or other nearby outside markets.

PUBLIC FACILITIES

Churches are at convenient points in the rural communities, but most schools are located in towns. All sections of the county, however, are served by school busses, which take the pupils to and from consolidated schools. In communities where families live some distance from public roads, the children have to walk to points where the busses make stops. Both school buildings and churches are available for agricultural meetings and for social gatherings. There is no college or institution of higher learning in the county. Throughout the county 22 post offices are distributed, and rural mail service extends to all communities.

Telephone and electric services are available in the more densely populated sections and in some other parts of the county. In 1945,

63 farms had a telephone. In the same year an electric distribution line was within one-fourth mile of the 1,003 farms reporting and 715 homes were lighted by electricity.

SOIL SURVEY METHODS

In making a soil survey the soils are examined, classified, and mapped in the field and their characteristics recorded, particularly in regard to the growth of various crops, grasses, and trees.

The soils and underlying formations are examined systematically in many locations. Test pits are dug, borings made, and highway or railroad cuts and other exposures are studied. Each reveals a series of distinct soil layers, or horizons, termed collectively the soil profile. Each horizon, as well as the underlying parent material, is studied in detail, and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The chemical reaction of the soil and its content of lime and salts are determined by simple tests.[4] Other external features taken into consideration are drainage, both internal and external, the relief, or lay of the land, and the interrelations of soil and vegetation.

The soils are classified according to their characteristics, both internal and external, with special emphasis being given to those features that influence the adaptation of the land to the production of crop plants, grasses, and trees. On the basis of these characteristics, soils are grouped in classification units: (1) Series, (2) types, (3), phases, (4) complexes, and (5) miscellaneous land types.

The series is a group of soils having the same genetic horizons that are similar in important characteristics and arrangement in the soil profile and having similar parent material. Thus, the series comprises soils having essentially the same color, structure, natural drainage, and other important internal characteristics and the same range in relief. The texture of the upper part of the soil, including that commonly plowed, may differ within a series. The series are given geographic names taken from localities near which they were first identified. Thus, Porters, Ashe, Clifton, and Tusquitee are names of important soil series in Mitchell County.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of this texture—sand, loamy sand, fine sandy loam, loam, silt loam, clay loam, silty clay loam, or clay—is added to the series name to give a complete name to the soil type. Hayesville loam and Hayesville clay loam are soil types within the Hayesville series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics.

Most soil types are separated into two or more phases depending on differences in external features as slope degree of erosion, and stoniness. Where two or more soils of a given type are mapped, the one

[4] The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH of 7 indicates precise neutrality; higher values, alkalinity; and lower values, acidity. Indicator solutions are used to determine the chemical reaction. The presence of lime is detected by the use of a dilute solution of hydrochloric acid. All soils in Mitchell County are medium to strongly acid in their native condition.

which is without phase designation is referred to as the normal phase of the type. For example, if a soil type has slopes that range from 3 to 12 percent, the type may be mapped in two phases, an undulating phase (3- to 8-percent slopes) and a gently rolling phase (8- to 12-percent slopes). A soil that has been eroded in places may be mapped in two or more phases, an uneroded, or normal, phase (denoted by the name of the soil type only), an eroded phase, and perhaps a severely eroded phase.

In some places, two or more soil units may be in such intimate or mixed pattern that they cannot be clearly shown separately on the soil map, but must be mapped as a complex. An example of a soil complex is Porters-Clifton loams.

Some areas of land that have little or no true soil are termed miscellaneous land types. Examples in this county are Alluvial soils, undifferentiated, Rock outcrop, and Rough stony land (Porters soil material).

The soil surveyor makes a map of the county showing the location of each of the soil types, phases, complexes, and miscellaneous land types in relation to roads, houses, streams, lakes, and other local cultural and natural features of the landscape.

A glossary (p. 83) gives the definitions of many unfamiliar terms used in the report.

SOILS OF MITCHELL COUNTY

GENERAL NATURE OF THE SOILS

The soils of Mitchell County have been classified and mapped as 18 soil series. Also mapped are six miscellaneous land types—Alluvial soils, undifferentiated; Rock outcrop; Rolling stony land (Clifton soil material); Rough gullied land (Clifton and Talladega soil materials); Rough stony land (Porters soil material); and Stony colluvium (Porters soil material). The external and internal characteristics and related features of the soil series are given in table 2.

TABLE 2.—*External and internal characteristics of the soil series of Mitchell County, N. C.*

Soil series	Relief	Drainage	Surface soil (A horizon)	Subsoil (B horizon)	Substratum (C horizon)
MOUNTAIN UPLANDS					
Ashe	Hilly to steep	Good to excessive.	Gray loam or sandy loam	Pale-yellow loose loam	Residual material from—Granite and gneiss.
Porters	do	do	Brown to dark-brown loam	Brown to reddish-brown clay loam or loam.	Do.
Burton	Hilly	do	Very dark-gray or almost black stony loam.	Yellowish-brown friable clay loam.	Do.
Clifton	Rolling to steep	do	Brown or reddish-brown clay loam.	Dark-brown to reddish-brown firm clay.	Dark basic igneous and metamorphic rocks.
Chandler	Steep	do	Gray or grayish-brown mellow loam.	Yellow to grayish-yellow micaceous clay loam.	Mica schist.
Talladega	Hilly to steep	do	Brown silt loam	Light-red to yellowish-red very micaceous clay.	Do.
Ramsey	Steep	do	Yellowish-gray loam	Light-yellow clay loam or fine sandy clay.	Highly siliceous rock.
Tusquitee	Undulating to hilly.	do	Brown loam	Yellowish-brown friable clay loam or loam.	Colluvium from igneous and metamorphic rocks.
INTERMOUNTAIN UPLANDS					
Hayesville	Rolling to steep	Good to excessive.	Gray to brownish-yellow clay loam.	Brownish-red compact brittle clay.	Residual material from—Granite, gneiss, and schist.
Balfour	Rolling to hilly	do	Grayish-brown loam	Yellowish-brown or light reddish-brown clay loam.	Granite and gneiss.
Edneyville	Undulating to hilly.	do	Grayish-brown to grayish-yellow fine sandy loam.	Yellow or brownish-yellow fine sandy clay.	Do.
Worsham	Gently sloping to sloping.	Poor	Gray to dark-gray loam	Mottled yellow, brown, and gray heavy clay.	Do.

Watauga	Rolling to hilly	Good to excessive.	Light-brown to brownish-gray loam.	Yellowish-brown to light reddish-brown moderately friable clay loam to clay.	Mica schist.
Talladega	Hilly to steep	do	Brown silt loam	Light red to yellowish-red very micaceous clay.	Do.
Chandler	Steep	do	Gray or grayish-brown mellow loam.	Yellow to brownish-yellow micaceous clay loam.	Do.
Fannin	Rolling to hilly	do	Grayish-brown or light-brown loam.	Light-red or yellowish-red clay loam or clay.	Do.
Clifton	Rolling to steep	do	Brown or reddish-brown clay loam.	Dark-brown to reddish-brown firm clay.	Dark basic igneous and metamorphic rocks.
Tusquitee	Undulating to hilly.	do	Brown loam	Brown friable clay loam or loam.	Colluvium from igneous and metamorphic rocks.
Tate	Gently sloping to hilly.	Good	Grayish-brown to brown silt loam.	Yellow to light yellowish-red friable clay loam or heavy silt loam.	Do.
LOW STREAM TERRACES					
Altavista	Nearly level to gently sloping.	Slow to moderately good.	Gray to grayish-yellow sandy loam.	Yellow friable or moderately compact sandy clay loam to fine sandy clay.	Moderately recent alluvium from igneous and metamorphic rocks.
State	Very gently sloping to sloping.	Good	Brown silt loam	Yellowish-brown to reddish-brown friable clay loam.	Do.
FIRST BOTTOMS					
Congaree	Level or nearly level.	Good	Brown loamy fine sand to silt loam.	Yellowish-brown loamy fine sand to fine sandy clay.	Recent alluvium from granite, gneiss, and schist.

As shown in table 2, eight soil series are common to the mountain uplands. Four of these also are common to the intermountain uplands. Mountain uplands are characterized by their high elevation, long steep slopes, and narrow valleys, whereas intermountain uplands have comparatively low elevations and are less steep, but have strongly rolling to hilly topography and somewhat more open valleys.

The Tusquitee soils are developed on colluvium or local alluvium and are common to both mountain and intermountain uplands. They are brown, fertile, and among the most desirable soils of the county for agriculture. Soils of the other seven series are developed in place over their parent rock, and differences among them arise chiefly from differences in the parent rock.

The Ashe soils are developed over light-colored granite and gneiss. They have a gray loamy surface soil and a pale-yellow to brownish yellow relatively open and permeable subsoil. Relief is strongly rolling to very steep and natural fertility is low, but the less steep areas are suitable for agriculture and respond to good management.

The Porters soils, developed over dark-colored granite and gneiss, have a brown loamy surface soil and a brown to reddish-brown relatively open and permeable subsoil. Although moderately high in fertility, these soils are used principally for pasture or forest because of their predominantly steep to very steep slopes. The Porters soils occur chiefly on mountain uplands, but a small acreage occupies the intermountain uplands, where they are associated with Balfour soils.

The Clifton soils, common to both mountain and intermountain uplands, have developed over dark-colored basic igneous and metamorphic rocks, chiefly hornblende gneiss and schist. The brown to reddish-brown clay loam surface soil and dark-brown to reddish-brown heavy and firmer clay subsoil are considerably less permeable than those of the Ashe and Porters soils. These soils are among the more fertile upland soils, and the less steep areas are suitable for cropping under good management.

The Chandler soils are developed over highly micaceous rock, chiefly schist and gneiss, and are shallow to bedrock. They have a gray silt loam surface soil and a brownish-yellow friable clay loam subsoil, with a large quantity of mica throughout the soil mass. The hilly to steep relief and low natural fertility make them poorly suited to agricultural use, but the less steep areas are fairly well suited to grazing when properly managed.

Like the Chandler soils, the Talladega soils are developed over highly micaceous rock, but differ in having a redder subsoil and a slightly greater depth to bedrock. Their steep slope makes them poorly suited to crops or pasture. Both soils are common to the mountain and intermountain uplands.

The Ramsey soils, developed over highly siliceous rock, have a yellowish-gray loam surface soil and a light-yellow clay loam or fine sandy clay subsoil that is shallow to bedrock. Owing to their steepness and low fertility, they are poorly suited to agriculture, although the less strongly sloping areas are capable of providing pasture under proper management.

The Burton soil is distinguished by its dark organic surface layer. The surface soil is very dark-gray or almost black stony loam, containing a large quantity of organic matter, and the subsoil is yellowish-brown, brown, or grayish-brown friable clay loam or loam. Most

areas are in coves or on north-facing slopes, practically all in association with the Ashe and Porters soils. The relief is strongly sloping or hilly, and because of its stony character the soil is not well suited to crops, although it supports a good grazing cover.

Eleven soil series are common to the intermountain uplands; four of these—the Clifton, Chandler, Talladega, and Tusquitee, which are also common to the mountain uplands—are briefly described with that group.

The Hayesville soils, developed over light-colored granite, gneiss, and schist, have a gray, brownish-yellow, and reddish surface soil and a red or brownish-red brittle clay subsoil. The relief is rolling to steep. These soils are moderately fertile, and most of the less sloping areas are suited to crops.

The Balfour soils, which have formed from light-colored granite and gneiss, and to some extent from schist, have a light-gray or grayish-brown loam surface soil and a yellowish-brown to light reddish-brown fine sandy clay loam or friable clay loam subsoil. They resemble the Porters soils in some respects, differing essentially in having a greater average depth to bedrock and in having a subsoil with a better defined structure and finer texture. They occupy areas with sloping to hilly relief and are moderately fertile. Nearly all of these soils are suited to crops and respond readily to good management.

The Watauga soils are light-colored and friable like the Ashe soils and like the Chandler soils contain an appreciable quantity of mica. They are derived from mica schist and mica gneiss and have a smoother surface than either the Ashe or Chandler soils and essentially represent the thicker well-developed profile associated with the Chandler soils.

The Fannin soils have a reddish-colored friable subsoil containing much mica. They may be considered as well-developed Talladega soils, but occupy areas of smoother relief. Although only moderately fertile, Watauga and Fannin soils are fairly well suited to crops because of favorable relief and depth of subsoil.

The Edneyville soil has developed from light-colored granite and gneiss rocks. It has grayish-yellow loam surface soil and a yellow friable sandy clay subsoil. Although only medium in fertility, it responds readily to good management, has favorable relief, and is a good agricultural soil, especially for the production of truck crops.

The Tate soil, developed from colluvium and local alluvium, has a grayish-brown silt loam surface soil and a yellow to light yellowish-red friable clay loam subsoil. This fertile soil occurs on smooth to moderately sloping relief and is well suited to crops and pasture.

The Worsham soil is formed over granitic or gneissic material under imperfect to poor drainage conditions. It occurs at the base of some slopes, around the heads of springs, and along a few smaller streams. The surface soil is a dark-gray loam, and the subsoil, gray to almost white heavy sandy clay loam to clay loam of variable depth. Because of poor drainage, almost all of this soil is in woodland; when cleared, it is fair to good for pasture.

The two soil series (Altavista and State) formed on low stream terraces are inextensive and consist of a mixture of materials washed from upland areas. They are largely on intermountain landscapes.

The Altavista soil, formed on relatively low stream terraces, has a gray to grayish-yellow fine-textured surface and a moderately com-

pact yellow sandy clay loam to fine sandy clay subsoil that is underlain by mottled gray and yellow moderately compact clayey material. Runoff and internal drainage are fairly good for most areas. This soil is moderately productive and well suited to many crops.

The State soil, which also occurs on low stream terraces, has a brown silt loam surface soil and a yellowish-brown to reddish-brown friable sandy clay loam to clay loam subsoil. With its good runoff and internal drainage, it is one of the most productive soils in the county and is suited to practically all crops commonly grown.

The Congaree soil, formed on the first bottoms of materials washed from soils of the uplands, is nearly level, fertile, and easily handled but subject to overflow. Other alluvial soils, occurring in a mixed or undifferentiated pattern, are associated with the Congaree soil. Some of these areas may need draining before they can be tilled. The undifferentiated soils, however, are mostly fertile, and though only some areas are suited to crops, a great part is used for pasture.

SOIL TYPES AND PHASES

Detailed descriptions of the soils and brief discussions of the manner in which each phase differs from the others are given in the following pages. Drainage conditions, slope range, and degree of erosion are given only in the type description unless these are the distinguishing features for the phase.

The agricultural relation, use suitability, present management, management requirements, estimated average crop yields, crop adaptations, and fertilizer requirements of the soil types and phases are discussed in the section on Use, Management, and Productivity of the Soils and in tables 9 and 12; the distribution of the soils is shown on the accompanying soil map; and their acreage and proportionate extent are given in table 3. Detailed descriptions of the more important normal soil types are given in Morphology and Genesis of Soils.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Mitchell County, N. C.*

Soil	Acres	Percent
Alluvial soils, undifferentiated	1, 156	0. 8
Altavista sandy loam	66	(1)
Ashe loam:		
Eroded steep phase	1, 536	1. 1
Eroded very steep phase	987	. 7
Steep phase	1, 006	. 7
Very steep phase	391	. 3
Ashe sandy loam, hilly phase	402	. 3
Ashe stony loam	9, 876	7. 0
Balfour loam:		
Eroded hilly phase	712	. 5
Hilly phase	1, 976	1. 4
Rolling phase	252	. 2
Burton stony loam	736	. 5

[1] Less than 0.1 percent.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Mitchell County, N. C.*—Continued

Soil	Acres	Percent
Chandler loam:		
Eroded steep phase	770	0.5
Severely eroded steep phase	161	.1
Steep phase	2,060	1.5
Clifton clay loam:		
Eroded hilly phase	2,544	1.8
Eroded rolling phase	1,093	.8
Eroded steep phase	3,274	2.3
Hilly phase	2,385	1.7
Rolling phase	505	.4
Severely eroded hilly phase	1,867	1.3
Severely eroded steep phase	4,334	3.1
Steep phase	1,282	.9
Clifton stony clay loam:		
Hilly phase	972	.7
Severely eroded steep phase	983	.7
Steep phase	3,337	2.4
Congaree fine sandy loam	312	.2
Edneyville loam	835	.6
Fannin loam:		
Eroded hilly phase	428	.3
Hilly phase	2,093	1.5
Rolling phase	411	.3
Hayesville clay loam:		
Eroded hilly phase	572	.4
Eroded rolling phase	254	.2
Severely eroded hilly phase	255	.2
Hayesville loam:		
Hilly phase	988	.7
Steep phase	716	.5
Porters-Clifton loams:		
Eroded steep phases	1,152	.8
Steep phases	637	.5
Porters loam:		
Eroded steep phase	5,011	3.5
Eroded very steep phase	1,158	.8
Severely eroded steep phase	626	.4
Steep phase	6,513	4.6
Very steep phase	1,646	1.2
Porters stony loam:		
Eroded steep phase	560	.4
Hilly phase	1,883	1.3
Steep phase	11,164	7.9
Very steep phase	31,006	22.0
Ramsey stony loam:		
Steep phase	1,246	.9
Very steep phase	268	.2
Rock outcrop	36	(1)
Rolling stony land (Clifton soil material)	375	.3
Rough gullied land (Clifton and Talladega soil materials)	361	.3
Rough stony land (Porters soil material)	7,172	5.1
State silt loam	215	.2
Stony colluvium (Porters soil material)	972	.7
Talladega clay loam:		
Severely eroded hilly phase	491	.3
Severely eroded steep phase	186	.1

[1] Less than 0.1 percent.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Mitchell County, N. C.*—Continued

Soil	Acres	Percent
Talladega loam:		
Hilly phase	392	.3
Steep phase	421	.3
Tate silt loam	368	.3
Tusquitee loam:		
Hilly phase	826	.6
Rolling phase	701	.5
Undulating phase	6,354	4.5
Tusquitee stony loam:		
Hilly phase	1,166	.8
Rolling phase	710	.5
Watauga loam:		
Eroded hilly phase	1,100	.8
Hilly phase	3,091	2.2
Rolling phase	527	.4
Severely eroded hilly phase	641	.5
Worsham loam	298	.2
Total	140,800	100.0

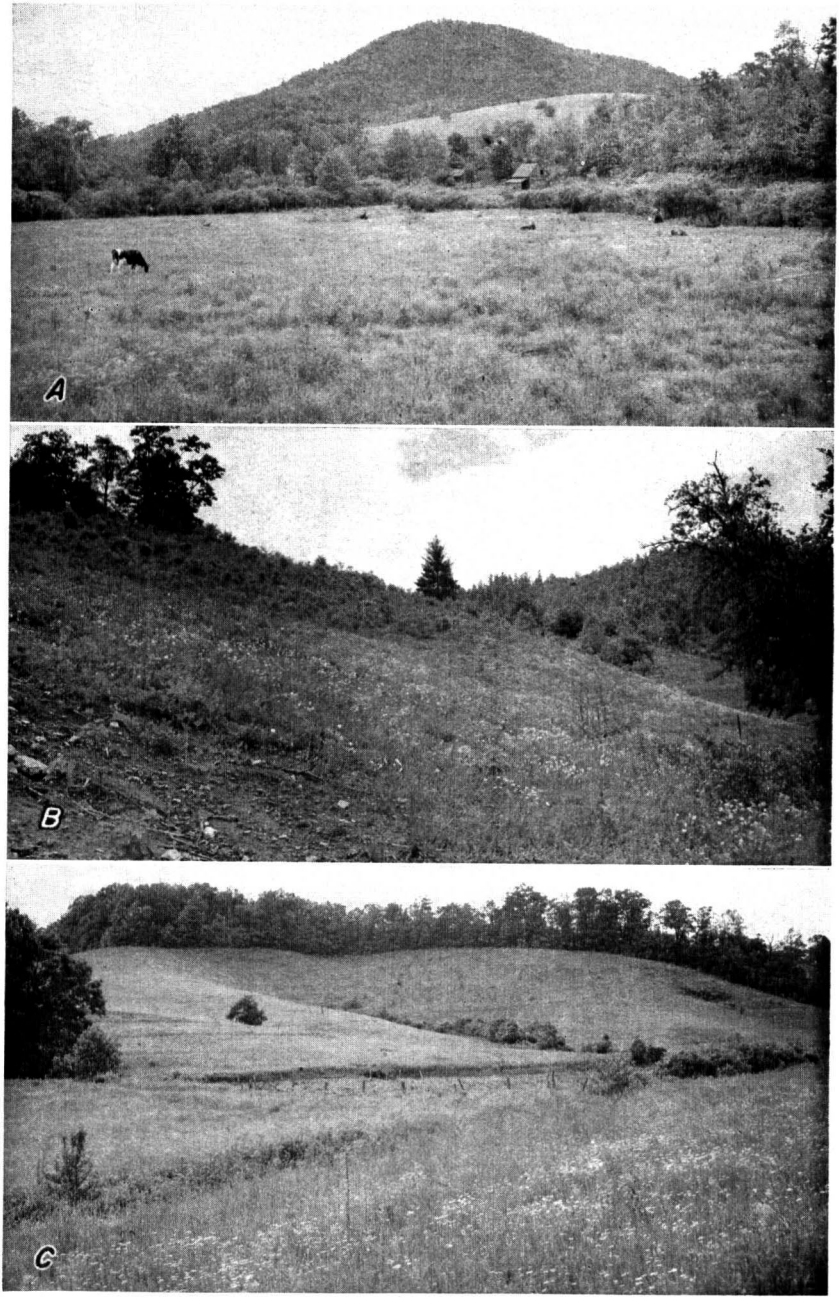
Alluvial soils, undifferentiated.—These soils occur in first-bottom positions along some of the streams and include members of the Chewacla, Congaree, Toxaway, and Wehadkee series so intricately mixed that they could not be segregated on the soil map. The color of the surface soil ranges from brown through gray to dark gray or nearly black, and the texture, from fine sandy loam to silt loam. The color of the subsoil varies from brown to gray, and the texture, from fine sandy loam to silty clay.

The areas resembling Congaree soil have a brown surface soil and a light-brown subsoil with little definite profile development. The Chewacla areas have a brown surface soil, which is about 12 inches thick and resembles the Congaree, and a grayish-brown fine sandy loam to silt loam subsoil splotched in the lower part with rust-brown material. Areas resembling Toxaway soils have a very dark-gray to almost black silt loam surface soil about 20 inches thick and a gray, mottled with brown and yellow, silt loam to silty clay subsoil. The surface material of the Wehadkee soils is gray, mottled with brown and yellow, very fine sandy loam to silt loam and the subsoil ranges from gray to light-gray silt loam to silty clay.

The Congaree soils in this complex are well drained; the Chewacla soils, imperfectly drained; and the Toxaway and Wehadkee soils, poorly drained. The Wehadkee soils are frequently waterlogged throughout the year, the water table seldom being more than a few inches below the surface. Toxaway soils are less wet than the Wehadkee, but often remain saturated for long periods after rain, while Chewacla soils seldom are excessively wet for more than a few days.

The generally poor drainage and the highly variable soil material make Alluvial soils, undifferentiated, better suited to pasture than crops (pl. 2, *A*). Much of the area lies so low that drainage for crop use would involve the expensive operation of lowering the stream

North Toe River in an intermountain upland area with rugged mountain upland in background. The intermountain area, chiefly of Clifton soils, is used for crops or pasture; mountain areas, chiefly Porter soils, are principally forested. (Courtesy of U. S. Geological Survey.)



A, Pasture on Alluvial soils, undifferentiated.
B, Clifton clay loam, eroded steep phase, lying idle and unproductive following a period of cropping.
C, Intermountain landscape: Close-growing hay crops and pasture on eroded rolling and hilly soils, predominately Hayesville.

channel for an adequate outlet. Corn and vegetable production would be very good, could adequate drainage be secured. The small better drained part is suited to crops, especially corn and hay.

Altavista sandy loam.—This light-colored soil has developed on low stream terraces in widely distributed small bodies associated with the Congaree soil. The parent material was washed from upland soils overlying light-colored igneous and metamorphic rocks. Relief is nearly level to gently sloping, and internal drainage is slow to moderate. A few small level areas are included in which both runoff and internal drainage are very slow. Much of this soil is in the vicinity of Spruce Pine.

Following is a profile description in a cultivated area:

0 to 9 inches, gray or grayish-yellow friable sandy loam to fine sandy loam.
9 to 35 inches, yellow friable sandy clay loam to moderately compact fine sandy clay.
35 inches +, mottled yellow and gray silty clay loam grading into yellowish-gray fine sandy loam.

In places the soil has a few water-worn rocks or cobbles throughout the profile.

The reaction is medium to strongly acid, and the plant-nutrient content is not high. The soil is permeable to roots and moisture to a depth of about 34 inches and has moisture relations that are favorable to crops. On the nearly level areas, however, the slow runoff is detrimental to most crops and hinders field operations during periods of excessive rainfall.

Most areas of this soil are cleared and used principally for corn and potatoes. Their smooth surface, good moisture relations, and ability to respond to management make them desirable for agriculture.

Ashe loam, steep phase.—This light-colored soil has developed on high elevations in mountainous areas on slopes of 30 to 60 percent. It is formed from granite or light-colored gneiss, the depth to which is usually not more than 3 feet. Areas occur chiefly in small bodies distributed throughout the northern part of the county, mostly in association with soils poorly suited to crops. The native vegetation consisted chiefly of hardwoods, largely various oaks, and maple, poplar, and sourwood. Some dogwood, basswood, magnolia (cucumber-tree), and blackgum also grow on this phase.

The following is a typical profile:

0 to 4 inches, dark grayish-brown loam.
4 to 10 inches, light-yellow friable loam.
10 to 25 inches, yellow friable very permeable fine sandy clay.
25 inches +, pale brownish-yellow, streaked with brown, very friable gritty loam grading within a few inches into disintegrated gneiss rock.

Variations in the depth to bedrock range from 18 to 40 inches, although rocks outcrop in places. The surface of a few areas has scattered stones.

This soil is medium to low in fertility and low in organic matter except in the surface layer, but it is readily permeable to plant roots and to moisture. It is medium to strongly acid. Runoff is rapid; internal drainage, medium.

All of this phase is in forest. Its steep slope and relative inaccessibility make it ill suited to crops requiring tillage, but Ashe loam,

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eroded steep phase, of similar slope is producing good pasture where properly fertilized and limed.

Ashe loam, eroded steep phase.—This phase differs from the steep phase, with which it is geographically associated, in having a more shallow surface layer, a moderately eroded condition, and excessive surface drainage. A few gullies, most of which are shallow enough to be crossed by tillage implements, are in places. The plow layer, including part of the original surface soil and some of the subsoil, is light-brown to grayish-yellow friable loam. Noticeable local variations are in color, texture of surface soil and subsoil, and depth to bedrock.

All of this phase has been cleared. It is poorly suited to tilled crops unless handled in long rotations with sod-forming crops, but it is fairly well suited to pasture. It responds readily to amendments, especially lime and phosphate.

Ashe loam, very steep phase.—This phase differs from the steep phase chiefly in having steeper slopes (exceeding 60 percent). The depth to rock is more variable and, in general, more shallow. Reaction is medium to strongly acid. Internal drainage is rapid and runoff very rapid.

The chief variations consist of differences in degree of stoniness and in depth of soil over rock. Some cleared land, used for crops or for pasture, is included in the phase. Erosion has removed part of the soil and most of the organic material from the surface, decreasing its water-holding capacity and making it more susceptible to further erosion.

Most of this soil is under hardwood forest. Because of its very steep slope it is not physically suited to crops and its value as pasture land is low.

Ashe loam, eroded very steep phase.—This phase differs from the steep phase in having steeper slopes (exceeding 60 percent) and from both the steep and very steep phases in being moderately eroded. There is also a greater variation in depth to bedrock, but where eroded the soil is consistently more shallow. The plow layer, which includes part of the original surface soil and some of the subsoil, is yellowish to brownish friable loam. The soil is strongly acid. A few shallow gullies are in some areas.

All of the phase has been cultivated at some time, but most of it is now in pasture. Good management practices would require permanent pasture on the less eroded areas and trees on the more severely damaged tracts. None of it should be used for crops. Applications of lime and phosphate must be added to secure adequate sod, and controlled grazing is essential in places.

Ashe sandy loam, hilly phase.—This soil, formed over light-colored granite and gneiss, differs from Ashe loam essentially in being more open and porous throughout. It occupies slopes mostly between 15 and 30 percent on some of the higher mountains, most of it being at elevations above 3,200 feet. It is strongly acid. The more extensive bodies are southwest of Spruce Pine, in the vicinity of Minpro, and south and southeast of Bear Creek Church. Surface and internal drainage are rapid.

A typical profile shows the following characteristics:

0 to 3 inches, dark-gray to brown friable to loose sandy loam, containing considerable organic matter.
3 to 14 inches, pale-yellow to yellow friable fine sandy clay loam with some coarse particles of quartz and feldspar.
14 inches +, light-gray soft granitic rock or hard bedrock, containing a high percentage of feldspar.

In places a few stones are on the surface. The depth of soil over rock is usually shallow but varies from 12 to 25 inches. In a few places there are included areas that contain large quantities of micaceous material and closely resemble soils of the Chandler series.

Chiefly because of its shallow profile, this phase is not well suited to crops requiring tillage or to pasture. It is susceptible to erosion and requires careful management. Over half of it is under hardwood forest, mostly mixed oaks.

Ashe stony loam.—This soil is similar to Ashe loam, steep phase, except in degree of stoniness. Quantities of rocks, varying from gravel to large boulders, are on the surface and throughout the soil profile, and bedrock outcrops in places. The slope is steep (30 to 60 percent). Runoff is rapid to very rapid, and internal drainage, medium to rapid. The soil is medium to strongly acid. Areas of this soil are south, southwest, and southeast of Chalk Mountain, southwest of Spruce Pine, and in the northwestern part of the county. The chief variation is in the depth of soil over parent rock. A few included areas, which have been cleared and have become moderately eroded, are now in pasture. This soil is very poorly suited to crops and poorly suited to pasture. Its best use is forest.

Balfour loam, rolling phase.—This intermountain upland soil has formed over granite or gneiss and is comparatively deep to bedrock. It occurs on 7 to 15 percent slopes, and runoff and internal drainage are medium. The soil is in numerous small areas on the valley uplands, associated with the Porters and Hayesville series. The natural vegetation consisted of various species of oaks, maple, and yellow-poplar.

The following is a description of a typical profile:

0 to 9 inches, brown friable loam containing a relatively high quantity of organic matter.
9 to 40 inches, light reddish-brown friable porous clay loam.
40 inches +, brown or brownish-yellow fine sandy clay mottled with brown and yellow over partly disintegrated granitic rock.

The soil is medium to strongly acid. Air, moisture, and roots penetrate it easily, and the water-holding capacity is good. Some angular rock fragments, up to 10 inches in diameter, may occur on the surface and in the soil but are too few to interfere materially with cultivation. Erosion is not a serious hazard. This soil is well suited to most crops grown in the county, and management problems are not difficult. Several small included areas have been cleared and, as a result, have lost up to 25 percent of the surface soil by accelerated erosion.

Balfour loam, hilly phase.—Because of its 15- to 30-percent slopes, this phase has appreciably greater susceptibility to accelerated erosion than the rolling phase. Runoff is moderate to rapid and internal drainage is moderate. A few small areas that have been cleared of the native hardwood forest cover and, as a result, have lost up to 25

percent of the original surface soil are included in the phase. This loss and the subsequent mixture of the rest of the surface soil with the subsoil by plowing has given a slightly heavier surface texture. The depth of the solum and the content of stones and gravel on the surface and through the soil vary. This phase is associated with the Porters soils.

The small part of this phase that has been cleared is well suited to most commonly grown crops, but it has a hilly relief and consequently should not be planted frequently to row crops. The soil is strongly acid. Fertilizer and lime requirements are moderately high, and careful management is required to prevent material losses by runoff. As most of this soil occurs at high elevations it has a relatively short growing season.

Balfour loam, eroded hilly phase.—This phase differs from the rolling phase in having steeper slopes (15 to 30 percent) and from both the rolling and hilly phases in having lost 25 to 75 percent of the surface soil by erosion. The quantity of surface material removed varies considerably, but in most areas the first 6 inches, or plow layer, which is a mixture of surface soil and subsoil, is brownish-gray to grayish-yellow friable loam. Below this material the soil is reddish-brown friable porous clay loam grading at 34 to 36 inches into brown or brownish-yellow fine sandy clay, which is mottled with brown and yellow and rests on the partly disintegrated rock. This soil is medium to strongly acid. Runoff is good to excessive and internal drainage is good. Variations occur in the degree of erosion and in the depth to bedrock.

All of this soil has been cleared, and most of it is being used for crops or for pasture. The hilly relief and the loss of surface soil make frequent growing of row crops inadvisable. Fertilizer and lime requirements are high, and where tillage is practiced regularly, careful management is required to prevent material losses by runoff.

Burton stony loam.—Areas of this soil are on the more elevated mountainous areas, as Roan High Bluff, Cloudland, Bald Mountain, Jane Bald, Long Level Mountain, and Deerplay Gap. Smaller areas are at Beauty Spot and Beauty Spot Gap. Some areas are natural balds. Native vegetation, except on the balds, consists chiefly of various oaks, white ash, sugar maple, beech, and birch trees. Mountain-laurel and rhododendron often form dense undergrowth. The relief is hilly or very strongly sloping (15- to 30-percent gradient), and both runoff and internal drainage are medium, except in coves where internal drainage is low. The soil remains moist much of the time. It is high in organic content and is strongly acid.

The following is a profile description:

0 to 16 inches, dark grayish-brown to almost black friable loam with a high proportion of well-decomposed organic matter.
16 to 25 inches, light-brown to brown or brownish-yellow friable loam to clay loam.
25 inches +, brownish-yellow clay mixed with slightly weathered angular granitic rock fragments.

Variations occur in the thickness of the first two soil layers, the upper of which ranges from 10 to 20 inches and the lower from 4 to 20 inches. The black surface soil rests directly on the parent rock in some places. On the more moist northern slopes the lower part of the subsoil is

frequently gray. Angular rock fragments, up to 10 inches in diameter, and occasional boulders are strewn over the surface and mixed with the soil mass. Bedrock outcrops in places.

All this soil is under virgin forest, shrub, or grass cover. Owing to its stoniness, shallow depth to bedrock, steep slope, and poorly accessible locations, most of it is not suited to tillage. More areas, however, would be capable of affording good pasture under proper management.

Chandler loam, steep phase.—This phase is poorly suited to agriculture and is best used for forest. It has developed from mica schist, the depth to which varies considerably. It is associated with the Ashe, Porters, Talladega, and other soils on the mountain uplands. Because of its 30 percent or more slope and shallowness, it is very susceptible to erosion when cleared. External drainage is rapid to very rapid and internal drainage is medium to rapid. Soil reaction is strongly acid. Forest growth consists of chestnut, white, post, and red oaks; maple; hickory; dogwood; sourwood; tuliptree (yellow-poplar); locust; and white pine. The undergrowth is mountain-laurel and rhododendron.

The following profile description is from a wooded area:

0 to 2 inches, gray loose loam with some organic matter.
2 to 8 inches, brownish-gray to grayish-yellow friable micaceous loam.
8 to 22 inches, brownish-yellow to yellow micaceous clay loam with a decidedly slick or greasy feel when rubbed between the fingers.
22 inches +, brownish-yellow soft, slick, decomposed mica schist.

The surface coloring is fairly uniform, and the range in texture is from silt loam to loam. The subsoil varies from a micaceous clay loam to a gritty clay loam, containing less mica flakes than normal. In the southwestern part of the county, rock fragments up to 10 inches in diameter are on the surface and mixed with the soil material. These stony areas are indicated on the soil map by symbol.

Chandler loam, eroded steep phase.—This phase differs from the steep phase in having a more shallow surface layer, a moderately eroded condition, and excessive surface drainage. In places there are a few gullies, but most of them can be crossed by tillage implements. The plow layer, which includes part of the original surface soil and some of the subsoil, is grayish- or brownish-yellow friable smooth to almost greasy loam. Some local variations occur in color of the surface and subsoil and in soil depth to bedrock. The phase, which is strongly acid, is found chiefly in the south-central part of the county.

All of this phase has been cleared, and most of it is now used for pasture. Because of its low fertility, shallow profile, and susceptibility to further erosion, it is very poorly suited to crops requiring tillage and poorly suited to pasture. Pasture vegetation does not respond well to lime and phosphorus, and this, along with the droughty nature of the soil, makes it difficult to maintain an adequate vegetative cover for good grazing and protection against erosion losses. In general, the suitability is limited to forest.

Chandler loam, severely eroded steep phase.—Differing from the steep and eroded steep phases chiefly in its susceptibility to erosion, this phase has lost 75 percent or more of the original surface layer and, in places, part of the upper subsoil by erosion. Many gullies are too deep to be obliterated by ordinary tillage operations but may

be crossed by average farm machinery. The plow layer, which includes the rest of the original surface soil and some of the subsoil, is brownish-yellow friable smooth almost greasy loam to light clay loam. External drainage is very rapid and internal drainage medium. The phase is strongly acid. Variations occur in the degree of erosion, the depth and frequency of gullies, and quantity of stone.

All areas of this phase have been under cultivation at some time, but a part has been allowed to revert to trees, principally white pine. The remaining open areas are largely in poor to fair pasture. Practically no areas are suitable for tillage, and they produce adequate pasture only under careful and expensive management. Apparently the best use is for forest.

Clifton clay loam, hilly phase.—Areas of this phase range from a few acres to about 200 acres in extent. They occur in many places on the valley uplands, where the soil is associated with the Hayesville, Fannin, Watauga, and Chandler soils. This soil has developed on hilly relief (15- to 30-percent slopes) in the intermountain sections. It has formed from dark basic igneous and metamorphic rocks, chiefly Roan gneiss. External drainage is medium to rapid and internal drainage slow to medium. This soil is medium to strongly acid throughout the profile; the organic content is not high. The native vegetation consisted of several species of oaks, red maple, yellow-poplar, hickory, sourwood, dogwood, and scattered white pine and black locust.

The following profile was from a forested area:

0 to 2 inches, dark-brown loam containing some organic matter.
2 to 7 inches, reddish-brown friable clay loam.
7 to 38 inches, dark brownish-red clay with a nutlike structure; moderately friable when dry and sticky when wet.
38 inches +, ocherous-yellow, yellowish-red, and red speckled with black soft weathered rock.

Variations occur in the depth or thickness of the first three layers. The first two layers combined are between 5 and 8 inches, and the third, between 30 and 45 inches. The phase also varies in degree of stoniness. All areas have a small quanity of flat angular stones ranging up to 18 inches in length, and a few areas have enough to interfere with cultivation. The color of surface and subsoil may range from brown to almost red.

Included with this soil are a few cleared areas that have become moderately eroded and a small area of Rabun clay loam, a similar and closely associated soil, which is a darker red and consists of slightly heavier clay.

Practically all of Clifton clay loam, hilly phase, is in forest, only about 15 percent having been cleared for agricultural use. The soil is fairly well suited to clover, alfalfa, grasses and other sod crops, and small grains, especially wheat and barley. It is susceptible to accelerated erosion, and areas now cleared should be used for sod-forming crops or planted to a rotation in which row crops occupy the land not more than 1 year in 3. Additional areas on the less hilly relief could be cleared and used under rotation systems shown in table 9. Strip-crop rotations are used to great advantage in parts of the county on eroded phases of this soil but were not established soon enough for maximum possible control of water and soil movement.

Clifton clay loam, eroded hilly phase.—This phase differs from the hilly phase in having a more shallow surface layer, a moderately eroded condition, and more rapid surface drainage. The quantity of material lost varies greatly, but generally the plow layer includes part of the original surface soil and some of the subsoil and is brown or reddish-brown friable clay loam. In places, especially on the steeper slopes, there is some moderate gullying. Internal drainage is medium to slow, and the soil is strongly acid. Included with this phase are a few small areas with a milder relief, 7 to 15 percent slopes, and consequently less susceptibility to erosion.

Practically all of Clifton clay loam, eroded hilly phase, is used for crops or pasture. It is moderately well suited to sod crops. Tilled crops may be grown in long rotations, but good management practices must be followed to prevent high erosion losses. When the organic-matter content is raised the water-holding capacity will increase, the tilth improve, and better yields result.

Clifton clay loam, severely eroded hilly phase.—This phase differs from the hilly phase in having a darker, much shallower surface layer consisting chiefly of clayey subsoil material, more rapid surface drainage, and slower percolation, or internal drainage. A number of the gullies are too deep to be obliterated by tillage operations, but they usually can be crossed by ordinary farm machinery. In places many flat angular stones ranging up to 18 inches long have been exposed on the surface with the removal of the soil.

Because of the severely eroded condition and relatively steep relief, this soil should be reforested. Shortleaf and probably loblolly pines are among the trees better suited for planting, although white pine is probably suited to the cooler, more northerly facing slopes and locust to the more permeable sites.

Clifton clay loam, rolling phase.—Areas of this phase are associated with other Clifton soils near Wing and Dula Knob. It differs from the hilly phase of Clifton clay loam chiefly in having a smoother surface and a greater depth to bedrock. The slope range generally is from 7 to 15 percent. External drainage is good and internal, medium to slow. The soil is medium acid.

A few areas have been cleared and are slightly eroded. As the slope is favorable and fertility is moderately high, most areas, with good management, could be cleared and used for the production of tilled crops in relatively short rotations. The steeper or more eroded soils thus released from cultivation could be placed in sod-forming crops or returned to forest.

Clifton clay loam, eroded rolling phase.—This phase is characterized by milder relief, a moderately eroded condition, and a darker surface color than the hilly phase. The quantity of material removed by erosion varies considerably, but in most areas the upper 6 inches, or the plow layer, is reddish-brown friable clay loam. There are only a few shallow gullies. External drainage is good and internal drainage medium to slow. Reaction is medium to strongly acid.

This soil is well suited to most crops commonly grown in the county. Despite its eroded condition it may be used in relatively short rotations provided it is well managed. With the addition of organic

matter, lime, phosphate, and potash, excellent yields are obtained and runoff adequately controlled on a few well-managed areas.

Clifton clay loam, steep phase.—This soil differs from the hilly phase chiefly in having a much steeper slope (above 30 percent) and a somewhat less well-developed profile. Internal drainage is medium to slow and external drainage is rapid. The soil reaction is medium to strongly acid. A few small scattered areas of stony loam were included in mapping this phase.

This steep phase has a moderately high fertility level, but because of its slope it is difficult to work and subject to erosion when cultivated. The less steep areas are suitable for pasture under good management, but the steepest areas are probably best used for forest. Most of it is in forest that consists of various oaks, maple, poplar, linden, and some hemlock.

Clifton clay loam, eroded steep phase.—This phase differs from the hilly phase chiefly in having steeper slopes and, as a result of erosion, a more shallow surface soil. In some places there are a few gullies; most of them, however, can be crossed by tillage implements. The plow layer, including part of the original surface soil and some of the subsoil, is reddish-brown clay loam. Local variations exist in the color and texture of the surface soil and subsoil, in the degree of erosion, and in the depth or thickness of the subsoil. Stones are present on the surface and through the soil in places. The phase is medium to strongly acid. Included with this soil are a few areas of Clifton clay loam, eroded very steep phase, which differ from the eroded steep phase chiefly in having steeper slopes (60 percent and more) and in being more susceptible to losses by accelerated erosion.

All of this phase has been cleared. About half is in crops, nearly a third in pasture, and the rest idle. It is poorly suited to crops because of the steepness of the slopes and eroded condition (pl. 2, *B*), but it will produce fair to good pasture with the use of lime and fertilizer.

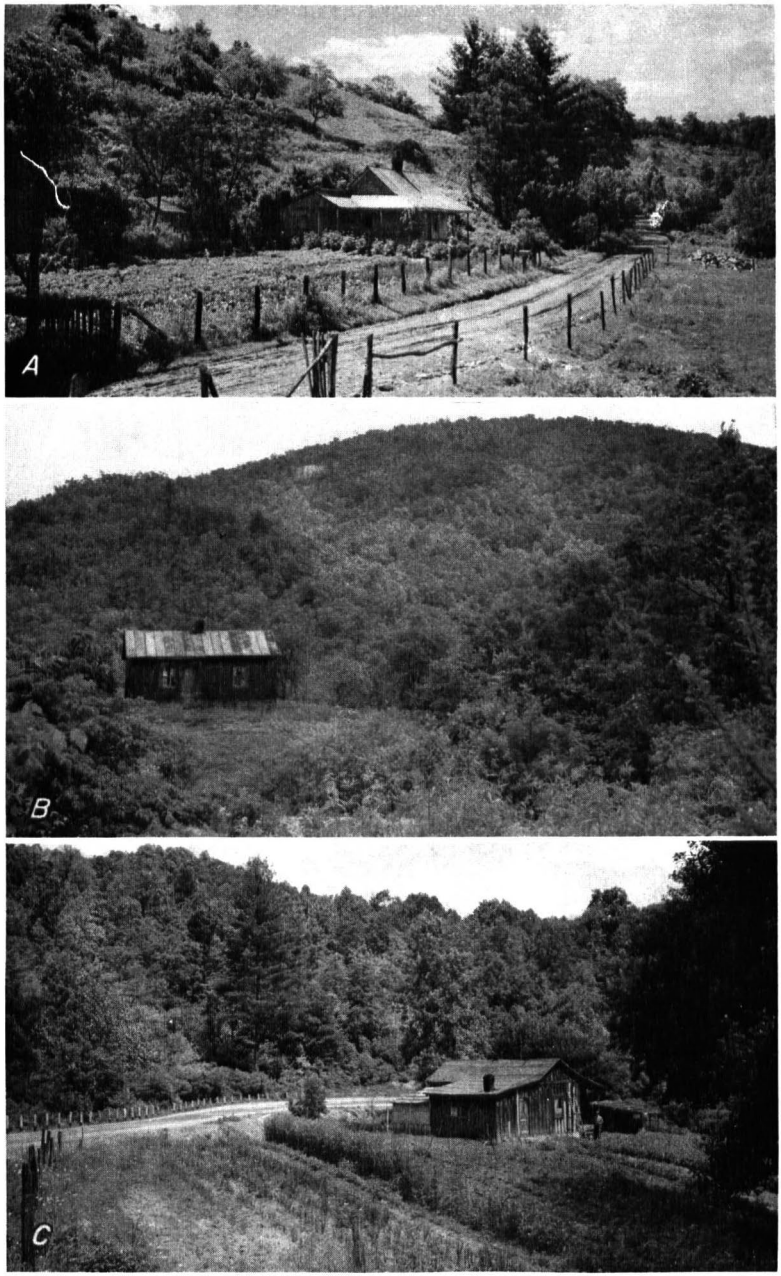
Clifton clay loam, severely eroded steep phase.—This phase differs from the hilly phase in having steeper slopes, a much shallower surface soil, a severely eroded condition, much more excessive runoff, and slower internal drainage. All of the phase is gullied, and in places there are numerous gullies that are too deep to be crossed by tillage implements. The plow layer, which includes the small part of the remaining original soil and some of the subsoil, is reddish brown to dark red. Variations occur in the color and depth of the original surface soil and in the texture of the soil and depth to bedrock. The soil is medium acid.

All of this severely eroded steep phase has been cleared and used for crops, but about one-half is now pastured, one-third is idle, and the rest is in crops. Some areas have been abandoned and are growing up in broomsedge, brambles, and white pine. As the phase is very poorly suited to crops and only fair for pasture, much of it should be returned to forest. The planting of pine or other suitable seedlings will probably aid greatly in controlling erosion within a few years.

Clifton stony clay loam, hilly phase.—Areas of this phase differ from Clifton clay loam, hilly phase, chiefly in having sufficient stone to interfere materially with tillage operations. In general, the depth

A and *B*, Slopes determining land-use pattern on Edneyville loam: Smoother parts in foreground are easily worked and well suited to crops requiring tillage; steeper areas in background are forested.

C, Strip crop farming of Porters loam, eroded steep phase, consisting of mixed red clover, timothy meadow, and corn.



A, Typical farm site in the valley adjacent to tillable areas of soils on bottom lands or colluvial slopes with the farm garden on a well-drained smooth, fertile tract of bottom land; pasture or idle land predominates on the eroded strong slopes of Hayesville clay loam in background.

B, Forest on Rough stony land (Porters soil material) and Ashe stony loam on Chalk Mountain near Spruce Pine.

C, General landscape on Tusquitee loam, rolling phase—a smooth fertile soil on foot slopes and along draws, commonly associated with extensive areas of steeper soils poorly suited to tillage.

to bedrock is less and the nutlike structure of the subsoil is less well defined. The size of the stones range from small gravel to huge boulders, with outcrops of bedrock in places. External drainage is medium to rapid; internal drainage, medium to slow. The soil is medium acid throughout.

About one-third of this soil has been cleared and used for crops. Tillage operations are difficult because of the high stone content. Much land, therefore, is left idle, and a considerable part is lost by erosion, despite the stones. Most of this eroded land has reverted to woodland or is now in fair quality pasture.

Clifton stony clay loam, steep phase.—A considerable number of stones, varying from gravel to huge boulders, are on the surface and throughout the soil profile of this phase. Bedrock outcrops in places. The soil differs from Clifton clay loam, hilly phase, in having a larger number of stones, steeper relief, and consequently greater susceptibility to erosion. External drainage is medium to rapid; internal drainage, medium. Reaction is medium acid. It is mapped in close association with other Clifton soils. Because of its steep slopes and stoniness, this phase is difficult to till and should be kept in woodland.

Included are a few areas, totaling about 100 areas, of Clifton stony clay loam, very steep phase, which differ in having steeper relief (above 60 percent). External drainage on these areas is very rapid.

Clifton stony clay loam, severely eroded steep phase.—This phase differs from the hilly phase of Clifton clay loam in relief and in degree of stoniness and erosion. The slopes are steeper (30 to 60 percent) and consequently are more susceptible to erosion. A sufficient number of stones varying in size from small gravel to large boulders are on the surface and mixed with the soil mass to interfere with tillage operations. In places bedrock outcrops. The quantity of material lost by erosion (generally over 75 percent of the surface soil and in places part of the subsoil) varies greatly, but in most areas the plow layer is reddish-brown or red clay or clay loam, which is a mixture of surface soil and subsoil material. In some places this soil is severely gullied. Internal drainage is medium to rapid; external drainage, rapid to very rapid.

This phase is unsuited to crops and pasture, and its most feasible use is forest. Shortleaf pine and, on the more favorable sites, white pine and black locust are well suited and can be expected to yield timber for fence posts and other purposes. The forest, however, must be protected from grazing and fire.

Congaree fine sandy loam.—This brown well-drained soil of the first bottoms is formed from alluvial material derived from uplands underlain largely by gneiss, schist, and granite. It is level or nearly level and subject to overflow. Reaction is medium to strongly acid. External drainage is medium to slow and internal drainage medium to very rapid.

The following is the description of a profile in a cultivated area:

0 to 16 inches, grayish-brown to light-brown friable to loose fine sandy loam with a small quantity of decomposed organic matter.

16 to 32 inches, yellowish-brown, light-brown, or brown friable crumbly fine sandy loam to fine sandy clay loam or fine sandy clay; only slightly sticky when wet.

32 inches +, mottled gray, brown, and yellow loamy fine sand, fine sand, fine sandy loam, or silt loam.

Considerable variation exists in the texture and in the thickness of the layers. The surface soil is 8 to 20 inches thick, and the second layer, 20 to 32 inches. In some places the top layer consists of silt loam or very fine sandy loam material and in others of sandy loam, and the second layer may be silt loam, loamy fine sand, or loamy sand. Finely divided mica flakes occur throughout the profile. Some range exists in both external and internal drainage among areas of different texture. The more sandy bodies usually have slightly greater relief and consequently better external drainage and more rapid internal drainage than areas of very fine texture.

This is one of the most desirable soils in the county for corn, truck crops, burley tobacco, and grass. Practically all of it is used for tilled crops. Although organic matter is normally deficient, it may be supplied by growing and turning under leguminous crops, particularly crimson clover or vetch. This soil is subject to overflow, but it may be intensively cropped in short rotations with light work stock and equipment. It responds well to proper fertilization.

Edneyville loam.—This upland soil occurs in small bodies in association with the Ashe and Watauga soils. The slope is fairly gentle (5 to 20 percent) (pl. 3, *A* and *B*). The soil is strongly acid throughout. Most areas are in hardwood forest of various oaks, sugar maple, yellow-poplar, magnolia (cucumbertree), basswood (linden), sourwood, dogwood, and in places an undergrowth of rhododendron and mountain-laurel.

The following profile occurs in a forested area:

0 to 2 inches, gray, grayish-brown, or dark-gray loose loam.
2 to 8 inches, light grayish-yellow to yellow friable loam.
8 to 30 inches, yellow to brownish-yellow friable clay loam or light clay.
30 inches +, light-gray disintegrated and partly decomposed granitic rock of varying thickness over hard rock.

A few small slightly steeper areas, which have slopes ranging up to about 25 percent, are mapped with this soil. Some areas that have been cleared and have become slightly eroded are also included.

Except in the surface layer Edneyville loam is medium in fertility and apparently low in organic matter. It is readily permeable to roots. External drainage is medium and internal drainage medium to rapid. Most of this soil is responsive to management and could be cleared for cultivation. It will not, however, give the high yields possible on the Tusquitee soils.

Fannin loam, rolling phase.—This phase is formed from highly micaceous schist rock in intermountain uplands in association with the Chandler, Talladega, and Watauga soils. Slopes range from 7 to 15 percent. External and internal drainage are medium, and the soil is strongly acid. Native vegetation was predominantly deciduous hardwood—chiefly oak, maple, sourwood, and dogwood.

A profile in a forested area shows these characteristics:

0 to 2 inches, brown loam considerably stained with organic matter.
2 to 7 inches, grayish-brown or light-brown friable loam with considerable fine mica flakes and numerous plant roots.
7 to 22 inches, brownish-red, light-red, or red clay loam with an appreciable quantity of mica flakes; plant roots throughout the upper half of the layer.

22 to 35 inches, yellowish-red to red highly micaceous clay having a very smooth or slick feel; readily crushed to an almost structureless mass.
35 inches +, pinkish, reddish, yellowish, and grayish disintegrated mica schist rock with red clayey material on outside of rock fragments; strongly acid throughout.

About 15 percent of this phase is in cropland, 10 percent is idle, 10 percent is in forest, and the rest is in pasture. It is permeable to roots, air, and water. The moisture relations and slopes are generally favorable to crops. Although the soil is susceptible to erosion and the cleared areas have lost a small part of the original surface soil, it is desirable for crops and pasture. It responds to good management and can be handled safely under moderately long rotations. More acreage could be cleared for crop use.

Fannin loam, hilly phase.—This phase differs from the rolling phase chiefly in having steeper slopes (15 to 30 percent). External drainage is rapid and internal drainage medium. The soil is strongly acid. Practically all of it is in native vegetation, principally various oaks and some maple, sourwood, dogwood, and mountain-laurel. Areas of this phase are in the southeastern part of the county closely associated with other Fannin soils. The soil should not be extensively cleared for crop use, because of the moderately steep relief and the high susceptibility to accelerated erosion. Pasture on some areas would probably furnish fair to good grazing for 5 months each year.

Fannin loam, eroded hilly phase.—Areas of this phase have a slope range of 15 to 30 percent and have lost more than 25 percent of the original surface soil by accelerated erosion. The quantity of material lost varies greatly. In average areas the light reddish-brown or red friable loam plow layer includes part of the surface soil and some subsoil. A few gullies, most of which are too deep to be obliterated by ordinary tillage, are crossable by farm equipment. Variations occur in the color and texture of the surface soil and subsoil and in the depth to bedrock. Soil reaction is strongly acid. Areas are associated with other Fannin soils. A few small areas that have lost over 75 percent of the original surface material and part of the subsoil and show some gullying are included with this phase.

All of Fannin loam, eroded hilly phase, has been cleared. About four-fifths is used for crops; the rest is lying idle or in pasture. It is poorly suited to crops but is fairly well suited to pasture. Row crops should not be planted more often than 1 year in 4, because of the erosion hazard. The more severely eroded areas should be in forest. Shortleaf pine and, on the more favorable northward slopes, white pine can be expected to yield timber within 25 to 35 years.

Hayesville loam, hilly phase.—This phase is developed over light-colored granite, gneiss, and schist in the intermountain uplands. It occurs on hilly relief (15 to 30 percent) in association with the Fannin and Clifton soils, principally in the south-central part of the county. External drainage is medium to rapid, and internal drainage medium. The following is a typical profile:

0 to 3 inches, gray loam; loose and open; stained with organic matter.
3 to 8 inches, gray or yellowish-gray friable loam with some angular quartz gravel.
8 to 12 inches, light-red or reddish-yellow fine sandy clay loam, friable fine sandy clay loam, or friable fine sandy clay.

12 to 40 inches, brownish-red to red compact clay; breaks rapidly when dry; somewhat sticky, but not plastic, when wet.
40 inches +, yellow and gray soft rock with black streaks.

The depth of the surface soil varies from 6 to 10 inches. The principal variations are the degree of profile development and the relative quantity of stone on the surface and mixed through the soil mass. The number of stones, however, is not sufficient to interfere appreciably with tillage.

Practically all of Hayesville loam, hilly phase, is in forest, consisting principally of hardwoods—white, post, Southern red, black, and chestnut oaks, hickory, dogwood, sourwood, red maple, black locust, yellow-poplar, and a few white pines—with an undergrowth of mountain-laurel, rhododendron, and huckleberry bushes. Much of it could be cleared and used for the production of crops in 4- or 5-year rotations, but strip-cropping practices should be followed on the longer slopes where the soil is susceptible to accelerated erosion.

Hayesville loam, steep phase.—This phase differs from the hilly phase in having steeper relief (30 to 60 percent) and consequently in being more susceptible to erosion. Internal drainage is medium and external drainage rapid. Most of this soil extends from Liberty Hill Church north to the vicinity of Ledger. Local variations occur in color and degree of stoniness. There are not enough stones, however, to interfere with its use for agricultural purposes.

Included with this steep phase are a few small areas of Hayesville loam, slightly eroded steep phase, which have lost less than 25 percent of the surface soil. Another inclusion is that of small moderately eroded areas, which have lost 25 to 75 percent of the surface soil and contain a few shallow gullies. Additional inclusions are areas of the severely eroded steep phase that have lost more than 75 percent of the surface soil and in places all the original surface and some of the subsoil. These areas, most of which are crossed by shallow to moderately deep gullies, have been cleared for agricultural use. The surface soil of the moderately and severely eroded soil bodies is clay loam formed by an admixture of subsoil with the remaining original surface soil through tillage operations. Its redder color is due to the mixing.

More of the steep phase could be cleared of its forest cover and planted to pasture and hay crops. If a good sod is maintained under careful management, there should be no serious erosion problem.

Hayesville clay loam, eroded hilly phase.—This phase consists of former Hayesville loam, hilly phase, from which 25 to 75 percent of the loam surface soil has been removed by erosion. Some areas are moderately gullied. Slopes range from 15 to 30 percent (pl. 2, *C*). In average areas the plow layer consists of reddish-brown relatively heavy-textured clay loam, formed by a mixture of surface soil and subsoil material. External drainage is rapid to excessive and internal drainage medium. The soil is strongly acid. This phase occurs in association with other Hayesville soils, mainly in the south-central part of the county, the principal areas being southeast, northeast, and north of Ledger.

Although susceptible to further erosion losses, this phase is capable of producing tilled crops and pasture (pl. 4, *A*). Where it is used for crops, however, its fertility and supply of organic matter should

be maintained at a moderately high level. The rotations should be long with close-growing vegetation being kept on the soil for 3 out of 4 years. Many slopes can be handled under a strip-crop system with only narrow row-crop strips.

Hayesville clay loam, severely eroded hilly phase.—This phase differs from Hayesville loam, hilly phase, in the color and texture of the surface material and in the degree of erosion. About 75 percent or more of the original surface soil and, in places, part of the subsoil have been removed. The plow layer in average areas is a reddish-brown or red clay loam or clay. In general, tillage operations do not obliterate the deep gullies that have formed in places, but they can be crossed by ordinary farm machinery. The soil is strongly acid. External drainage is very rapid and internal drainage medium. This soil occurs largely in association with the other Hayesville phases and with the Clifton soils in the southeastern part of the county and in the Bear Creek Church section in the southeast-central part.

About a third of this phase is in cropland, sixty percent is in pasture, and the rest is lying idle or covered with brush. All areas are susceptible to further erosion unless kept under permanent cover. Pasture sod requires relatively heavy applications of phosphate and lime, controlled grazing, and other protective measures. Gullied areas should be reforested.

Hayesville clay loam, eroded rolling phase.—This phase differs from Hayesville loam, hilly phase, in slope range, texture, degree of erosion, and in color of the surface soil. The relief is milder (7 to 15 percent), yet 25 to 75 percent of the original friable loam surface soil has been lost by accelerated erosion through long cultivation. The quantity of material lost varies greatly from place to place, but in average areas the plow layer is reddish-brown clay loam. Some areas show moderate gully damage. External drainage is rapid and internal drainage medium. The soil is medium to strongly acid.

A few small areas that are still in forest and are not eroded to any appreciable extent are mapped with this phase. Other included areas are severely eroded and have lost 75 percent or more of their surface soil.

Most of Hayesville clay loam, eroded rolling phase, is used for crops. Since erosion has removed much of the original loam surface, leaving a less penetrable clay loam, this soil is fairly susceptible to further erosion. Owing to its favorable relief and medium to high fertility, however, it is well suited to tilled crops provided they are grown in rotations with sod crops. Care should be exercised to maintain a good supply of organic matter in order to improve the water-holding capacity and the tilth, reduce runoff, and help bring about better yields.

Porters loam, steep phase.—This mountain upland soil, formed from granite, gneiss, or schist, is a member of the most extensive and widely scattered soil series in the county. It occurs in association with the Ashe, Clifton, Balfour, and Hayesville series on steep slopes of 30 to 60 percent. The soil is strongly acid. Both external and internal drainage are rapid. The soil is easily pervious to moisture, air, and roots, and its water-holding capacity is good. Some angular rock fragments, up to 10 inches in diameter, are on the surface and in

the soil, but they are too few to interfere materially with cultivation. The following is a description of a profile in a wooded tract:

0 to 2 inches, dark brownish-gray loose friable loam with a considerable quantity of well-decomposed organic matter.
2 to 10 inches, brown to dark-brown friable loam, containing some decomposed organic matter with numerous plant roots.
10 to 30 inches, yellowish-brown to light reddish-brown very friable clay loam or heavy loam of fine granular structure; some plant roots are present.
30 inches +, mixed gray, yellow, and light brownish-yellow soft friable partly decomposed gneiss, granite, or schist; some angular rock fragments are intermixed.

There is no uniformity in the thickness of the profile layers. The surface layer ranges from 5 to 12 inches thick, and the subsoil, 6 to 26 inches. In some places very little texture differentiation exists between the surface and subsoil; the predominant texture is loam. Color differences among the various layers, however, are fairly easily distinguishable in most places. A few areas that have been cleared, cultivated, and now are slightly eroded are included with this phase. These areas are being used to about an equal extent for pasture and crops.

Practically all of Porters loam, steep phase, is forested with hardwood principally of chestnut, white, post, Southern red, black, and pin oaks, black locust, buckeye, yellow-poplar, red maple, linden, magnolia (cucumbertree), dogwood, sourwood, a few hemlock, and some sugar maple and birch. Undergrowth consists of rhododendron, mountain-laurel, huckleberry, buckberry, and briers.

The soil is very good for pasture and is fair to good for most of the crops commonly grown in the county. Although the soil is moderately susceptible to accelerated erosion, tillage operations are difficult because of the steep slope. The best use for cleared lands is pasture. The response of the soil to amendments, particularly lime and phosphate on pasture, is excellent.

Porters loam, eroded steep phase.—Areas of this soil are scattered throughout the mountainous parts of the county in association with other Porters soils and with those of the Ashe and Clifton series. The soil is similar to the steep phase of Porters loam but has a shallower and in places finer textured surface layer and more rapid surface drainage. The plow layer, including part of the original surface soil and some of the subsoil, is generally light-brown friable loam. There is seldom any appreciable gully erosion. External drainage is very rapid and internal drainage rapid. Variations occur in the color and texture of the surface soil and subsoil and in the depth to bedrock. The soil is strongly acid.

All of this phase has been cleared and used for crops, but at present about one-third is in pasture, one-half is in crops (pl. 3, *C*), and the rest is lying idle or in brush. The eroded condition is largely due to the continuous use of row crops on the steeply sloping relief, although Porters soils are among the least susceptible of any upland soils to accelerated erosion. Most areas of this phase should be used for pasture and hay crops because of their moderate erosion. The difficulty of harvesting hay, however, on slopes of 40 percent or more is great, and all such slopes should probably be in pasture. The response

of crops to lime and phosphate is excellent, with the result that very good pasture sod can be established and maintained.

Porters loam, severely eroded steep phase.—Areas of this soil are scattered throughout the mountainous parts of the county in association with other Porters soils. It differs from Porters loam, steep phase, in having a very shallow surface layer. Most of the original surface soil and in places a part of the subsoil have been lost as a result of erosion. The plow layer, which is largely subsoil material, is brown heavy loam or friable clay loam. In places there are gullies, many of which are difficult to cross with farm machinery. Both external and internal drainage are very rapid, and the soil is strongly acid. Many local variations occur in the color and texture of the surface layer and in depth to bedrock.

All areas of this phase have been cleared and used for crops, but about 60 percent is now in pasture, and the rest, which has been abandoned for crops, is partly in broomsedge, brambles, low bushes, and white pines. The severely eroded condition is the result of continuous row cropping, particularly to corn. The soil was moderately productive, but the steep slopes were kept too long in crops. The gullied and other most severely eroded areas should be planted to white pine or locust trees; less damaged areas may be used for pasture. Despite its condition this phase usually shows good response to lime and phosphate and produces fair to good pasture if care is exercised in grazing. Stock should not be turned on pasture before growth is well established in spring, and it should be removed early enough in fall to permit the plants to make sufficient growth for protection from further soil losses in winter.

Porters loam, very steep phase.—This strongly acid mountain soil differs from the steep phase in having much steeper relief (more than 60 percent), a shallower profile, more rapid runoff, and, consequently, greater susceptibility to accelerated erosion. The soil allows rapid internal water movement. Areas are found throughout the mountainous sections. A few small areas have been cleared and are now used for pasture, but owing to accelerated erosion there has been considerable loss of the original soil. Native forest was dominantly chestnut with some oak, maple, beech, birch, yellow-poplar, and in places an undergrowth of rhododendron and mountain-laurel. Oak, with a few maple, yellow-poplar, and other trees, and an undergrowth of mountain-laurel and rhododendron, forms the present forest cover. Excessive slope makes further clearing of this phase ill advised; its best use is for forest.

Porters loam, eroded very steep phase.—This phase differs from the steep phase in having much steeper relief, a shallower surface soil owing to its moderately severe eroded condition, much more excessive runoff, and somewhat slower internal drainage. In places there is some gullying. The soil is strongly acid. Areas of the soil are associated with other Porters soils, chiefly south of Bakersville.

All areas have been cleared; some 80 percent of the phase is in pasture, and the rest is abandoned and growing up in broomsedge, brambles, or white pine. Continued cropping has been responsible for the accelerated erosion, as it is impossible to retain soil on the slopes, which are 60 percent or more, unless they are covered by sod

crops. Even the application of adequate amendments for pasture maintenance is frequently difficult because of the inaccessibility of the phase to any type of vehicle except a sled. The best use for most of this soil is woodland, and white and shortleaf pines and black locust are among the better suited trees for planting.

Porters stony loam, hilly phase.—This phase differs from Porters loam, steep phase, in having a much milder relief (15 to 30 percent), a greater stone content, a somewhat shallower profile, slower surface and internal drainage, and less susceptibility to accelerated erosion. The soil is medium acid. Considerable variation occurs in content of stone and depth of the profile.

Practically all areas of the hilly phase are in forest of mixed hardwoods, with a few white pines on southern exposures. A few clearings are in pasture or used for crops, but tillage is difficult because of the high stone content. Additional areas might be cleared for pasture, and if the surface stone were partly removed, would probably produce fair to good sod. Response to amendments is good.

Porters stony loam, steep phase.—Although closely associated with Porters loam, steep phase, this soil differs in degree of stoniness and depth to bedrock. A large number of stones and boulders are on the surface and throughout the soil profile, and there are some outcrops of bedrock. External and internal drainage are medium to rapid. Reaction is medium to strongly acid.

About 10 percent of this phase has been cleared, but more than half of the cleared areas are now lying idle and the rest is in pasture. The phase shows only slight soil loss from accelerated erosion; its high stone content, however, interferes with the growth of crops and pasture plants or, in the case of pasture, takes up so much surface space that the total grazing available is limited. As cultivation is difficult unless there is sufficient labor to remove much of the stone, the best use of the phase is woodland.

Porters stony loam, eroded steep phase.—This phase differs from Porters loam, steep phase, in having a much higher content of stone, a moderately eroded condition, and in being shallower to bedrock. The plow layer also has a lighter color and a slightly heavier texture. The number of stones on the surface and in the profile interfere with tillage operations unless they are laboriously removed by hand; in places, bedrock outcrops. External and internal drainage are medium to rapid. Reaction is medium to strongly acid. Areas of this phase are associated with other Porters soils throughout the mountain areas, the largest bodies being near Hawk, Big Spring Gap, and Glen Ayre.

All of this phase has been cleared and 80 percent or more is in pasture; the rest is abandoned and grown up in a sparse growth of broomsedge, brambles, and bushes. The stone content materially reduces the erosion hazard but greatly increases the difficulty of tillage. Pasture is only fair unless much of the surface stone has been removed. Response to lime and phosphate, however, is generally good.

Porters stony loam, very steep phase.—This phase, which is the most extensive soil in the county, differs from Porters loam, steep phase, in having much steeper relief (more than 60 percent), a much larger number of stones, a shallower profile, more excessive external

and internal drainage, and greater susceptibility to erosion when cleared. It differs from the other stony loams in being much steeper and also less well developed. Enough stones, varying in size from gravel to huge boulders, are on the surface and in the soil to interfere with tillage operations. Outcrops of bedrock are numerous. The soil is medium acid. Areas of the soil occur in all parts of the mountainous section of the county, but chiefly along the Tennessee State line and to the south.

Slight to moderate accelerated erosion has taken place on the few areas that have been cleared and are in poor pasture sod. Practically all of the phase, however, is in mixed hardwood forest with scattered hemlock, spruce, and some mountain-laurel and rhododendron. Because of the steep slopes and stoniness of the phase, areas still uncleared should be left in forest.

Porters-Clifton loams, steep phases.—Areas of Porters loam and Clifton loam so intricately mixed that they could not be represented separately on the soil map comprise this complex. It occurs on the intermountain uplands over dark basic igneous rock intermingled with gneiss and schist, and associated with Clifton and Porters soils, chiefly in an area from Boonford northwest to Relief along the North Toe River. The slope is steep (30 to 60 percent), but the soil is moderately deep to bedrock. Runoff is medium to rapid and internal drainage is medium.

The complex is medium acid and apparently has a fair supply of organic matter. Its water-holding capacity is comparatively good. Many of the areas have a few rock fragments on the surface and throughout the soil mass, and practically all areas are covered with a hardwood forest. The phases are suited to pasture provided they are properly seeded, given necessary amendments, and not overgrazed.

Porters-Clifton loams, eroded steep phases.—This complex consists of areas of the eroded steep phases of the Porters and Clifton loams so intricately mixed that they could not be represented separately on the soil map. It differs from the steep phases of the complex in that a considerable part (25 to 75 percent) of the original surface soil has been lost by accelerated erosion. As a result, the surface soil is lighter colored and more nearly clay loam in texture. In places it is moderately gullied. External drainage is rapid and internal drainage medium to slow. The complex varies greatly, owing to the mixed character of its components.

The soil, which is medium acid, is fairly well supplied with organic matter and has a comparatively good water-holding capacity. Many areas have a few rock fragments on the surface and mixed with the soil, but the rocks are seldom in sufficient quantities to interfere materially with tillage. Steepness of slope (30 to 60 percent) and the character of the soils comprising the complex make these phases very susceptible to further erosion. The complex has been cleared of hardwood forest cover. It is poorly suited to the production of tilled crops, but, if well managed, will produce good pasture. Care should be taken to maintain good sod at all times in order to control excessive runoff.

Ramsey stony loam, steep phase.—This strongly acid soil has formed over highly siliceous rock in the mountain areas and on some of the valley uplands. It occurs in somewhat segregated areas in the

northern part of the county in association with Rough stony land (Porters soil material). The general slope range is 30 to 60 percent. Stones that vary in size from small gravel to large boulders and occasional outcrops of bedrock interfere materially with tillage operations. External drainage is rapid to very rapid, and internal drainage, medium to rapid.

The following is a description of a profile in a wooded area:

0 to 2 inches, dark-gray loose somewhat gritty loam with an appreciable quantity of well-decomposed organic matter.
2 to 9 inches, yellowish-gray friable loam with some decomposed organic matter and numerous plant roots.
9 to 24 inches, light-yellow or grayish-yellow fine sandy clay loam or friable clay loam; somewhat firm in place but easily broken in small angular blocks when struck with a mattock; some plant roots and a few openings are present.
24 inches +, mingled yellow, light-gray, and brown soft friable well-decomposed shale, slate, or conglomerate.

Considerable variation exsits in the thickness of the profile layers. The depth of the surface soil is 3 to 10 inches; the subsoil, 6 to 25 inches; and the decomposed rock material, from a few inches to about 3 feet.

The steep phase of Ramsey stony loam has a low water-holding capacity and when cleared is very susceptible to accelerated erosion unless carefully managed. Most of the 10 percent that has been cleared is in poor pasture, which is lying idle or slowly reverting to woodland. The forest cover is largely mixed hardwoods, chiefly oak, hickory, and some sourwood and dogwood; southern exposures have some white and shortleaf pines. The best use of the soil is forest because of the steep slopes, high stone content, shallowness, and low fertility.

Ramsey stony loam, very steep phase.—This phase has much steeper relief (exceeding 60 percent) and greater susceptibility to erosion than the steep phase. External drainage is very rapid and internal drainage medium to rapid. The soil is strongly acid. Areas of the phase are in the northwestern part of the county along the Tennessee-North Carolina line. Owing to its steep slopes and stoniness, this phase is not suited to the production of intertilled crops or to pasture and should remain in forest.

Rock outcrop.—In most places this nonagricultural land type consists of bare exposures of rock. It is found in association with the more stony areas of Ashe and Porters soils and in areas of rough stony land, generally on mountainsides of steep to almost precipitous relief. An occasional scrub tree or bush may grow in crevices in the rock where small quantities of soil material have accumulated.

Rolling stony land (Clifton soil material).—This land type consists of rolling intermountain areas on which there are many small angular rock fragments, boulders, and numerous outcrops of bedrock. In some places the land may not be very stony, but bedrock is only a few inches below the surface. Where formed to any degree, the soil consists of Clifton material. The slope range is below 30 percent, but external drainage is medium to rapid and internal drainage medium to slow. This land type differs from Rough stony land (Porters soil material) only in relief and in the type of its soil material. Because of its relatively favorable relief about 60 percent of this land

has been cleared. It is used chiefly for pasture, for which it is farily well suited.

Rough gullied land (Clifton and Talladega soil materials).—Areas of this land type consist of Clifton or Talladega soils so severely gullied that they are practically worthless for crops or pasture. Small scattered areas occur in the central and south-central parts of the county. Most of the areas have been so mutilated by accelerated erosion that they could probably be reclaimed only by the slow process of reforestation. Runoff is very rapid and internal water movement slow.

Some areas lie idle, sometimes pastured, but most of them revert very slowly to woodland. Mulching is needed in many places to prevent further soil loss and to provide satisfactory moisture conditions for trees to which these areas should be reforested. Kudzu might be grown successfully in a few places where the elevation is below 3,000 feet and would adequately prevent further soil loss. The Civilian Conservation Corps did considerable reclamation work on rough gullied land between 1935 and 1940. Brush dams were built in the gullies and brush barriers and other mulching material placed on the intergully sections. Black locust, white pine, or shortleaf pine were planted, and most areas also seeded to grass and lespedeza. The cost was many times the value of the land, but today erosion not only has been stabilized, but a valuable timber crop is making good growth. Most farmers can do similar work themselves at moderate cost.

Rough stony land (Porters soil material).—This land type consists of steep, broken, or precipitous areas on which are many small angular rock fragments, boulders, and numerous outcrops of bedrock. In places the soil is not very stony, but bedrock is only a few inches below the surface. Where formed to any degree, the soil in most places consists of Porters material. On the highest mountains, however, it may be made up as Ashe, Burton, or Ramsey soil material. Slopes are mostly above 60 percent. External drainage is very rapid and internal drainage medium to rapid. Almost all of this land is in forest, which is its most practical use (pl. 4, *B*). The majority of the trees are hardwoods. Owing to the rough relief and poor quality of timber, the trees are generally left standing.

State silt loam.—This soil, which occurs on low stream terraces, was formed from material washed from the uplands underlain largely by granite and gneiss. It represents a stage of development about midway between the Congaree of the bottom lands and the Hiwassee of the high terraces, which occurs in only a few spots in Mitchell County. The relief is very gently to gently sloping (3 to 7 percent). External and internal drainage are medium, and the soil is generally at a sufficient elevation above streams to be relatively free from flood damage. Although only slightly susceptible to ersoion, some areas have become moderately eroded because of continual row cropping and lack of any protective measures. The soil is medium acid. Areas are found in association with Altavista and Congaree soils in relatively small bodies in the vicinities of Bakersville and Buladean.

A profile of a cultivated area shows the following characteristics:

0 to 10 inches, grayish-brown to brown friable silt loam
10 to 40 inches, yellowish-brown to reddish-brown friable loam to friable

silty clay loam; when moist, slightly sticky; when dry, easily crushed to a loose mass without definite structural form.

40 inches +, brown, reddish-brown, or light-red friable fine sandy clay loam, containing some rounded quartz gravel and cobblestones lightly cemented with clayey material.

The layers vary somewhat in thickness from place to place. The surface ranges from 6 to 12 inches; the subsoil, from 12 to 35; the substratum, from a few inches to 40 or 50.

Having favorable relief, excellent moisture conditions, good tilth, and well-balanced supply of plant nutrient material, this soil is one of the best in the county for general farming. Practically all of it is used for corn, small grain, hay, and other subsistence crops. Minor crops are vegetables and tobacco. This soil should produce most of the corn and other row crops, thereby releasing more upland areas to close-growing vegetation. The soil may be intensively cropped, and a winter crop as crimson clover or vetch turned under each year before the row crops are planted. The response of the soil to management is excellent.

Stony colluvium (Porters soil material).—This land type, which occurs on mountain foot slopes and along many of the streams, consists of colluvial and local alluvial material derived from Porters soils. In some places, however, it may be predominantly alluvial with characteristics similar to soils of the Congaree series. In general, the surface soil to a depth of about 12 inches is brown or dark-brown friable loam of weak granular structure. It contains a considerable quantity of decomposed organic matter mixed with the mineral material and is very stony. Below this layer to a depth of about 24 inches the material is practically the same as that above but contains much less organic matter. This layer is underlain by dark-colored hard and soft rock fragments. Most of the soil is sloping to very strongly sloping, although some of it is nearly level to gently sloping. External drainage is rapid and internal drainage medium to rapid.

In wooded areas a considerable quantity of organic matter derived from the decay of plant remains is on the surface. Bedrock outcrops occur in places. In some sections the soil is similar to Congaree fine sandy loam, but a large quantity of gravel, rock fragments up to 10 inches in diameter, and boulders is on the surface and throughout the profile. Some areas are partly composed of riverwash, a yellowish-brown material of sand, gravel, and semiangular rock fragments. About 60 percent of this land type is in pasture, the rest being in forest. If the stones could be removed from the smoother areas, it would make good cropland.

Talladega loam, steep phase.—This soil, formed over mica schist in the mountainous areas, has a steep slope (30 to 60 percent). It occurs in association with the Chandler and Fannin series. Reaction is medium to strongly acid throughout. External drainage is very rapid and internal drainage medium to rapid. Areas are north and southwest of Bakersville and north of Altapass.

The following is the description of a typical profile:

0 to 2 inches, dark-brown loam with some organic matter.

2 to 7 inches, brownish-red, with purplish cast, heavy loam containing a high percentage of finely divided mica flakes.

7 to 33 inches, light-red, pinkish-red, or salmon-red micaceous silty clay loam to clay loam with a greasy feel owing to the presence of a large

quantity of mica flakes; when dry, the material crushes to an almost powdery mass.

33 inches+, streaked gray, yellow, bright-red, and pink friable decomposed material (mica schist) retaining the structure of the original rock and having a smooth soapy or greasy feel.

Considerable variation in the thickness of the layers occurs from place to place. The depth of the surface layer is 4 to 6 inches; that of the subsoil, 12 to 40 inches; and the substratum, from a few inches to several feet.

Owing to its steep slopes and high susceptibility to erosion, this phase is poorly suited to crops and should remain in forest. At present the forest consists of white, post, chestnut, Southern red, and black oaks, red maple, black locust, sourwood, dogwood, yellow-poplar, and hickory, with an undergrowth of mountain-laurel and rhododendron.

Talladega loam, hilly phase.—This phase has milder relief (15 to 30 percent) than the steep phase and consequently is less susceptible to erosion. External drainage is medium to rapid and internal drainage medium. It is strongly acid. Variations occur in the color and depths of the surface soil and subsoil. A few small areas from which the hardwood forest has been cleared and the land used for crops and pasture are included with this phase. These areas have lost 25 to 75 percent of the surface soil. The quantity of material lost varies greatly, but in most places the plow layer, which now consists of a mixture of the surface soil and subsoil material, is red and has a slightly heavier texture.

The less hilly areas may be cleared of the forest cover and used for sod crops. They are capable of producing fair to good hay and pasture, providing they are well managed. Row crops should not be grown. The eroded areas that are now in tilled crops should be planted to sod crops for hay or for pasture. Response to management is slow.

Talladega clay loam, severely eroded steep phase.—This phase differs from the steep phase of Talladega loam in its susceptibility to erosion. Uncontrolled runoff has removed 75 percent or more of the surface soil and, in places, part of the subsoil. As a consequence of this loss the soil has a redder color and a heavier texture. External drainage is rapid to very rapid and internal drainage medium. The soil occurs in the vicinity of Bakersville. It is strongly acid. The steep slopes, eroded condition, and low fertility make this soil very poorly suited to agricultural use, and most of it is lying idle or grown up in sparse brush. If runoff is to be adequately checked and erosion controlled, all areas should be returned to forest.

Talladega clay loam, severely eroded hilly phase.—This phase has a milder relief than Talladega loam, steep phase, but has lost more than three-fourths of the original surface soil and, in places, some of the subsoil through erosion. It has a heavier or finer textured surface layer and is redder than the Talladega loam, steep phase. Gullies are numerous in places. Most of them may be crossed by ordinary farm machinery but they are too deep to be obliterated by tillage operations. External drainage is rapid to very rapid and internal drainage slow to medium. The soil is strongly acid. Areas are northeast, south, and southwest of Bakersville.

Most of this land is lying idle or has a sparse growth of brush. Because of the severely eroded condition and the resultant excessive runoff, the phase is very poorly suited to crops or pasture and should be planted in black locust or white pine seedlings. In some places it will be necessary to use mulch to check further soil r moval while the trees are gaining a foothold.

Tate silt loam.—This light-colored soil, which occurs on foot slopes of the intermountain and mountain uplands, has formed from colluvium and local alluvium that rolled, sloughed, or washed from the Chandler, Talladega, Fannin, Balfour, Watauga, and associated soils. The relief is gently sloping to hilly (3 to 25 precent). External drainage is medium and internal drainage medium to slow. The entire profile is medium to strongly acid.

The following description is of a profile in a pastured area:

0 to 18 inches, grayish-brown to brown friable silt loam with a considerable number of fine mica flakes.
18 to 35 inches, yellow, yellowish-brown, or light yellowish-red friable clay loam or heavy silt loam.
35 inches +, mottled gray, yellow, and brown friable clay or fine sandy clay.

The thickness of the layers varies considerably. The surface layer ranges from 8 to about 20 inches; the subsoil, from 17 to 40 inches; and the substratum, from 12 to 45 inches. In places near the source of streams, where internal drainage is slow, the lower layers are mottled yellow, brown, and gray. Locally, however, there may be little difference in color and texture throughout the soil mass. In a few places rock fragments are on the surface and throughout the soil.

Most of Tate silt loam has been cleared. About 75 percent is in crops or partly used for crops, 15 percent in pasture, and the rest in hardwood forest. The favorable slope, fertility, moisture conditions, and ease of tillage make this a desirable soil for all the crops commonly grown in the county. The soil gives an excellent response to good management and may be intensively cropped. Much of the corn should be grown on this soil, leaving the nearby more rolling to steep uplands for sod-forming or close-growing vegetation.

Tusquitee loam, rolling phase.—Small bodies of this phase occur in nearly all sections of the county. The soil is on mountain and intermountain uplands, and has formed from colluvial material derived from the Porters, Hayesville, and Balfour soils with which it is closely associated. In most places the color and texture of the layers are similar to those of Porters loam. The relief is sloping to strongly sloping and in places almost hilly, with gradients ranging from 7 to 25 percent. In most places internal drainage is rapid and external drainage medium. The soil is medium to strongly acid.

A profile in a cultivated area is as follows:

0 to 16 inches, brown to dark-brown friable loam.
16 to 40 inches, yellowish-brown, brownish-yellow, or reddish-brown friable clay loam or heavy loam.
40 inches +, yellowish-brown or brownish-yellow, splotched with brown, yellow, and gray, friable clay loam.

The thickness of the layers varies considerably from place to place—the surface layer, from 12 to 20 inches; the subsoil, from 15 to 35 inches; and the underlying material, from 24 inches to 4 or 5 feet. In some places near stream sources, where internal drainage is slow, the

lower layers are mottled with yellow, brown, and gray. Locally there may be little difference in color and texture throughout the soil mass. The profile is predominantly reddish brown where closely associated with Hayesville soils. In some areas the few rock fragments on the surface and in the soil mass are not sufficient to interfere with tillage.

All of this phase has been cleared and most of it is used for crops. Less than 10 percent is in pasture. Favorable relief, ready permeability, natural fertility, and ease of tillage make this a desirable soil for agriculture (pl. 4, *C*). It is especially well suited to leafy truck crops, silage corn, potatoes, and tobacco. Response to management is excellent, but care should be exercised in running crop rows and in maintaining a rotation system that will add organic matter to the soil by turning under winter legumes. This soil should frequently carry the row crop burden of the farm, leaving the uplands for pasture, hay, and forage crops.

Tusquitee loam, undulating phase.—This phase differs from the rolling phase in having milder relief (2 to about 7 percent), a somewhat greater depth, slower external and internal drainage, and less susceptibility to accelerated erosion. It occurs in close association with other Tusquitee, Porters, Balfour, and Hayesville soils.

Practically all of this phase has been cleared and is used for crops. It is suited to practically all crops commonly grown in the county, is easily handled and very productive, and constitutes one of the most desirable soils for intertilled crops. Failure to plow with the contour on some areas with slopes above 5 percent has resulted in slight accelerated erosion. With careful management this soil can carry the major part of row crops on farms where it occurs.

Tusquitee loam, hilly phase.—Areas of this phase occur in association with other Tusquitee soils and with the Porters and Balfour soils. It differs from the rolling phase in having steeper slope, more rapid external and internal drainage, and greater susceptibility to erosion. The slope range is 15 to 30 percent, but most areas are steeper than 20 percent.

Nearly all this productive soil has been cleared of the original hardwood forest. It has a wide crop suitability, and about 80 percent is used for crops, the rest for pasture. Row crops should be limited and grown in 3- or 4-year rotations because of the relatively strong slopes. Slopes are generally smooth, however, and lend themselves readily to strip cropping. Pasture mixtures do well on most Tusquitee soils.

Tusquitee stony loam, rolling phase.—This soil, which occurs in many places in the county in association with other Tusquitee soils, differs from Tusquitee loam, rolling phase, in its stone content. There is sufficient stony material—largely of rounded or flat-rounded shape and ranging from gravel to large boulders—on the surface and mixed with the soil to interfere with tillage operations. Slope gradients are gentle, ranging from 7 to 15 percent. The soil has medium external and internal drainage and is medium acid.

Nearly all of this soil has been cleared, but most of it is now in pasture. Except for its stones, which should be removed if labor is available, this is a desirable soil. In places where stones have been partly removed, it is as productive as Tusquitee loam, rolling phase.

Tusquitee stony loam, hilly phase.—This phase differs from

Tusquitee loam, rolling phase, in having a high stone content, steeper slopes (15 to 30 percent), more rapid external drainage, and in being slightly more susceptible to erosion. It occurs in association with other Tusquitee soils and with Porters and Balfour soils. Internal drainage is medium. The content of stone is sufficient to interfere with tillage operations.

Nearly all of this soil is in forest. It is only fair for crops or pasture, but if a sufficient quantity of stone is removed it becomes desirable for pasture and good for crops. As labor is a problem, the best use of this soil is for grazing.

Watauga loam, rolling phase.—This soil has formed from mica schist on the intermountain areas in association with soils of the Chandler, Talladega, and Fannin series. The relief is relatively mild (7 to 15 percent); external drainage is medium to good and internal drainage medium. Reaction is medium to strongly acid.

The following profile occurs in a wooded area:

0 to 3 inches, light-brown loose loam with some organic matter.
3 to 9 inches, brownish-gray friable loam with a small quantity of well-decomposed organic matter.
9 to 20 inches, yellowish-brown moderately friable clay loam; has sufficient finely divided mica flakes to give a slick feel; when dry, readily broken in small angular blocks that easily pulverize to a structureless mass; some plant roots are present.
20 to 35 inches, yellowish-brown to light reddish-brown moderately friable very micaceous clay that readily crushes when dry.
35 inches +, mingled gray, brown, and reddish-brown soft disintegrated mica schist rock.

Generally all the layers have sufficient mica flakes to give the soil a greasy feel, but in a few places the surface soil is gritty and does not have this characteristic smoothness.

About 40 percent of the soil is in forest of various oaks, hickory, and white and shortleaf pines. Nearly 35 percent is in crops, 10 percent is in pasture, and the rest lies idle. Approximately all areas of the idle land have become moderately eroded, resulting in a lighter colored and slightly heavier textured surface layer. This phase is moderately well suited to the many crops and to pasture. Despite favorable relief it is susceptible to accelerated erosion, but if carefully managed it may be intensively cropped.

Watauga loam, hilly phase.—Steeper relief (15- to 30-percent slopes), a less well-developed profile, more rapid external drainage, and a greater susceptibility to accelerated erosion are the characteristics in which this phase differs from the rolling phase. Internal drainage is medium. The soil is strongly acid. Areas occur in association with the other Watauga soils and with Chandler, Talladega, and Fannin soils. The largest ones are near Spruce Pine, Sunshine School, Jackson Gap, and Liberty Hill Church.

Most of this phase is in woodland of oak, hickory, dogwood, and white and shortleaf pines, with some mountain-laurel and rhododendron undergrowth. The hilly relief and the erodibility of the soil make it poorly suited to row crops unless used in a long rotation. It is fair to good for pasture, however, and many areas could be cleared and put in sod if given heavy applications of lime and phosphate.

Watauga loam, eroded hilly phase.—This phase differs from the rolling phase in having steeper relief (15- to 30-percent slopes), a mod-

erately severely eroded condition, much more rapid external drainage, and slower internal drainage. Areas occur in association with other Watauga soils. The soil is strongly acid. All the soil has been cleared and about one-third is cropped, one-half is pastured, and the rest is lying idle. The idle areas, which are the most severely eroded, are also gullied to some extent.

This soil is poorly suited to crops and is only fair for pasture. Good management requires long rotations, the incorporation of organic matter, substantial applications of fertilizer and lime, and careful tillage. Where row crops are necessary, each field should be strip cropped so that narrow bands of cultivated land are alternated with strips of protective sod-forming vegetation. The more severely sheet eroded spots, as well as the gullied areas, should be reforested.

Watauga loam, severely eroded hilly phase.—This strongly acid soil differs from the rolling phase in having steeper relief (15- to 30-percent slopes); a heavier textured and browner colored surface layer brought about by the loss of nearly all of the original surface soil and in places some of the subsoil; much more rapid external drainage and slower internal drainage; and susceptibility to even further erosion. Much of the soil is gullied.

The soil has been under cultivation for some time but is now largely abandoned because of the severely eroded condition. About half of it is in poor to fair pasture; the rest is in broomsedge or sparse brush. It is very poorly suited to crops and can be used better as woodland. Most areas to be reforested require some degree of mulching to protect the seedlings until they are established.

Worsham loam.—This poorly drained smooth soil has developed over granite, gneiss, and schist at the base of lower slopes of the intermountain areas. In many places it is near the bottom land in bench-like positions where there is enough seepage water to keep the soil wet for long periods. Most of the soil is of residual origin, but it is influenced by colluvial or alluvial deposits.

The following profile is from a pastured area:

0 to 8 inches, gray friable loam.
8 to 22 inches, yellow, brownish-yellow, and gray moderately friable clay loam.
22 inches +, gray heavy clay mottled with rust brown and yellow.

The profile varies greatly. In places, a thin layer of whitish quartz gravel occurs between the subsoil and the heavy clay substratum; in others, the subsoil is gray and heavy.

About one-half of the soil is in pasture, one-third in crops, and the rest lying idle or in open woodland. Most areas are normally too wet for crops, but if drained can be used for corn, soybeans, hay, and similar vegetation. Its best use, however, is for pasture. Heavy application of lime and frequent clipping to keep down undesirable grasses, rushes, and other weeds are necessary.

USE, MANAGEMENT, AND PRODUCTIVITY OF THE SOILS[5]

The term "land use" in this report refers to broad land use, as the use of soils suitable for (1) tilled crops, including row crops, small

[5] Prepared by members of the North Carolina Agricultural Experiment Station.

grains, and annual hay; (2) permanent pasture; and (3) forest. The term "soil management" refers to such practices as (1) the choice and rotation of crops; (2) application of soil amendments, as lime, manure, crop residues, and commercial fertilizer; (3) tillage practices; and (4) engineering measures for water control on the land. Productivity refers to the capacity of the soil to produce crops under prevailing farm practices or other defined systems of management. The soil may be productive of a crop but not well suited to it because of poor workability, conservability, or both.

USE CLASSES AND MANAGEMENT GROUPS OF SOILS

The soils of Mitchell County have been grouped on the basis of their relative physical suitability for agricultural use in five classes, which in the order of decreasing desirability for use in present agriculture, are First-class, Second-class, Third-class, Fourth-class, and Fifth-class soils. Although the soils of no one class are ideal for the existing agriculture, the First-class ones more nearly approach that ideal than do those of the Second-class. Likewise, the soils of each succeeding class are farther from that ideal than those of the preceding class.

The physical suitability of an individual soil for agricultural use is determined by its charactertistics, many of which contribute to the productivity, workability, and conservability of the soil.

These three conditions determine the physical suitability of the soil for agricultural use. An ideal soil is one that is very productive of a large number of important crops, easily worked, and capable of being conserved with a minimum of effort. All the soils of this county fall short of the ideal, but they differ widely in the degree of such shortcoming. For example, a soil may be highly productive and easily conserved but difficult to work. Productivity, workability, and conservability are intricately interrelated, and their effect on the physical use suitability of a soil is complex. No simple method of evaluating these three conditions and applying the values in determining physical use suitability can be used.

The relative suitability of the soils for agricultural use has been evaluated on the basis of the experience of farmers, extension workers, experiment station personnel, vocational agriculture teachers, soil surveyors, and others who work with soil. For example, a farmer knows that some soils on his farm are more desirable than others. By comparisons of this nature within farms and among farms, the soils may be ranked in the order of their desirability for the agriculture of the area under present conditions. Cattle are fairly important on many farms, and suitability of soils for permanent pasture has been considered in determining the rank of each soil in this classification. Where information based on experience with a soil was lacking, the soil was ranked by comparisons with other soils of similar characteristics for which information was available.

In the following pages the five use classes are discussed separately, each discussion being followed by a table that presents the estimated percentage of each soil used for crops, idle cropland, open pasture, and forest. The tables group together soils having similar management requirements. Following each table are separate discussions of the management groups, in which their common characteristics, present use and management, and management requirements are presented. The present management described is that under which the

yield data in columns A of table 12 are assumed to be obtained. The yield data in columns B of table 12 represent yields to be expected when the management requirements as herein described are fulfilled.

FIRST-CLASS SOILS

First-class soils are very good to excellent for agriculture. They are good to excellent cropland and very good to excellent for pasture. Although differing somewhat in their characteristics, they are relatively similar in physical suitability for agricultural use. Each is moderately well supplied with plant nutrients and has a fairly high natural productivity compared with other soils of the county. Even the most fertile soil of this group, however, is responsive to additions of certain amendments for some crops. All are well drained, yet their physical characteristics are such that they retain moisture fairly well, thereby tending to insure a relatively even and generally adequate supply for plant growth. Good tilth is easily maintained, and the range of moisture conditions for tillage is comparatively wide. The soils are moderately well supplied with organic matter, and their physical properties are favorable to the movement of air and moisture in the soil and to the free penetration of roots into all parts of the subsoil. None has any adverse condition or property, as stoniness and unfavorable relief. The problem of conserving fertility and soil material is relatively simple, and each soil is capable of intensive use without exacting management practices.

First-class soils cover 8,773 acres. About 75 percent of these soils is planted to crops; 10 percent is idle cropland; 5 percent, pasture; and about 10 percent, woodland. The First-class soils, listed by management groups, with the estimated percentage of each soil used for crops, idle cropland, open pasture, and forest in 1944, are given in table 4. Special crop adaptations, recommended rotations, and soil amendments are given in table 9.

TABLE 4.—*Estimated percentage of each First-class soil in crops, idle cropland, open pasture, and forest in Mitchell County, N. C., in 1944, according to management groups*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
	Percent	*Percent*	*Percent*	*Percent*
GROUP 1–A:				
Altavista sandy loam	100	------	------	------
Congaree fine sandy loam	100	------	------	------
GROUP 1–B:				
State silt loam	100	------	------	------
Tate silt loam	60	15	15	10
Tusquitee loam:				
Rolling phase	80	10	10	------
Undulating phase	85	10	5	------
GROUP 1–C:				
Balfour loam, rolling phase	50	------	------	50
Clifton clay loam, rolling phase	20	15	10	55

MANAGEMENT GROUP 1–A

The soils of group 1–A—Altavista sandy loam and Congaree fine sandy loam—are of alluvial material. The Congaree soil, which occupies first-bottom positions, and the Altavista soil, on low-terrace positions, are somewhat similar physically. They are well drained, and the relief is so nearly level that the control of runoff is no problem. The surface layers are friable, and the subsoils friable and open, yet they retain enough moisture and plant nutrients for any of the common crops. Where the soils have not been limed in recent years, they are acid. They are not deficient in nitrogen, phosphorus, and potash as are those on the uplands. During occasional flooding new soil material is deposited on the Congaree soil, which is probably better balanced with respect to plant-nutrient content than are the higher lying soils. The Altavista soil is seldom flooded. It is not so well suppiled with plant nutrients as the Congaree and is more deficient in nitrogen than in other nutrients.

These soils are mostly in corn and potatoes; minor crops are rye, oats, lespedeza, and tobacco. They are especially well suited to corn, meadow, pasture, and truck crops. No particular crop rotation is in general use, and little manure is used. Corn frequently is followed by corn or rye or crimson clover. In some places rye or oats may be cut for hay, while in others the crops are grazed, turned under, and followed by corn. A somewhat common practice is to follow crimson clover with corn, turning under the crimson clover as green manure. On a few farms potatoes, an all-season crop, are followed by rye and lespedeza or clover. The legume is kept on the land for 2 years, and then corn is planted.

Amendments other than lime are not as a rule added to land for corn and crimson clover. Potatoes and truck crops are heavily fertilized, usually with 600 to 800 pounds an acre of 4–12–4 [6] or 6–8–6 mixture. Lime is used for truck crops, but not for potatoes, because of the risk of diseases. Small grains usually receive 300 to 400 pounds an acre of 0–16–0. No special tillage practices are followed. The land is generally broken late in winter or early in spring. Light implements may be used, and deep plowing is not necessary.

Since these soils occupy favorable topographic positions, are well drained and easily tilled, and do not lose fertility rapidly by leaching, they can be used intensively. Although the average farm in this county has only a very few acres of First-class soils, these small acreages produce much of the corn, truck, and other row crops needed. Both soils in this group are well suited to corn for grain or silage and are very desirable for vegetables and for grasses for pasture or hay. When possible, however, uplands should be used for sod-forming crops, leaving these soils for row crops. Crops, as crimson clover and lespedeza, respond readily to applications of a ton of limestone at 4- to 6-year intervals or once within the rotation period. Farmers who secure favorable yields of corn, small grains, and hay on these soils apply some phosphate and a little potash to the land before planting the grain crops and add nitrogen as a top dressing. Legumes grown in the rotation are turned under to add nitrogen to the soil and benefit the corn crop that follows.

[6] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

MANAGEMENT GROUP 1–B

The soils of group 1–B—State and Tate silt loams and the rolling and undulating phases of Tusquitee loam—are on stream terraces and colluvial slopes. They are relatively level to gently sloping, well drained, and practically stone-free. The texture of the plow layer is loam and silt loam, and the color of the subsoil ranges from light brown to reddish brown.

Practically all areas of these soils are in crops or pasture. Corn, small grain, hay, and vegetables are the principal crops, and potatoes, vegetables, and tobacco are well suited to intensive row cropping. Truck crops are grown to a limited extent. Rotations generally are not practiced. Sometimes one row crop is alternated with another, but frequently the same crop is grown 2 or 3 years in succession. Some of the rotations used are as follows: Potatoes, rye or wheat, lespedeza or clover for 2 years; tobacco, rye, lespedeza or clover, and corn; corn, rye, corn; and corn, crimson clover, corn. A legume in the rotation is beneficial in maintaining high crop yields, especially when turned under.

Land planted to corn is treated with 200 to 300 pounds of 16-percent superphosphate an acre, and manure is added when available. Vegetable crops are fertilized heavily with 400 to 600 pounds of 6–8–6 or 4–12–4. Some farmers apply 1,000 to 2,000 pounds of lime an acre to land used for most truck crops except potatoes, but very little for other crops. No special tillage practices are followed. Usually land for row crops is broken in spring, and the rows are laid out the most convenient way across the fields.

Like the soils of group 1–A, the 1–B soils may be cropped intensively if planted to the proper rotations. State and Tate silt loams are well suited to silage corn, small grains, truck crops, and garden vegetables. The rolling and undulating phases of Tusquitee loam are well suited to garden vegetables, truck crops, grasses, legumes, and corn, and moderately well suited to wheat, alfalfa, and clover. All the soils are excellent for pasture and are a part of the very limited acreage of soils well suited to intensive use.

Lime produces favorable results on these acid soils. For alfalfa, an initial application of about 2 tons of ground limestone an acre is generally needed, but soil tests should be made to determine the proper quantity. All the soils have a favorable ratio of nitrogen, phosphorus, and potash, but the total content is not very high. Recommended adaptations, rotations, and soil amendments are given in table 9. Besides contour tillage, no special practices are necessary. All these soils are easily plowed and cultivated with light to moderately heavy implements.

MANAGEMENT GROUP 1–C

The soils of group 1–C—the rolling phases of Balfour loam and Clifton clay loam—are developed in place on residual material of weathered rock. Both are relatively smooth and well drained. The control of runoff is not a difficult problem, and moisture relations are favorable for any of the crops commonly grown. Soils not limed in recent years are acid. The soils as a group are somewhat less fertile than those of the other groups of First-class soils. Management prob-

lems, however, are relatively simple. The soils differ somewhat from each other—the Clifton soil has a clay loam plow layer and a moderately heavy clay subsoil, whereas the Balfour has a friable loam plow layer and a very friable clay loam or fine sandy clay loam subsoil.

About half the area of these soils is in crops or pasture. Corn, small grain, hay, and some truck crops, for which the soils are especially well suited, are grown. They are also excellent for apples, small fruits, clover, and alfalfa. Tobacco does very well when fertilized and manured. As on most other soil groups in the county, crop rotations are not in general use. Corn often follows corn, or tobacco may be grown for several successive years in the same field. In some communities rye is grown as a winter cover crop, then grazed or cut for hay. Occasionally rye is grazed and then turned under as green manure, or it may be grown only for grain. On a few farms corn and crimson clover are grown on the same field each year, the clover being turned under for the corn crop. On other farms a mixture of red and alsike clovers, timothy, and orchard grass may be sown in the corn and left for 2 years as a hay crop.

Fertilizer, as well as any available manure, is generally used on corn. Most cornland, however, receives only 200 to 400 pounds of 16-percent acid phosphate. The few small areas in truck crops are nearly always fertilized with 500 to 800 pounds an acres of 6–8–6 or 4–12–4 mixture. On some farms lime is used on clover and pasture land. Small grain receives 200 to 400 pounds an acre of 16-percent phosphate unless it follows a heavily fertilized truck crop, in which case no amendment is made. There are no special tillage or cropping practices.

The Balfour and Clifton soils may be cropped intensively, but rotations including sod-forming cover should be established so that no field is in row crops each year. Contour tillage usually checks most runoff, although terraces give good protection as well as serve as guide rows. Lime produces good results, especially on the Balfour soil.

SECOND-CLASS SOILS

Second-class soils are good to very good for agriculture. They are fair to good for cropland and good to excellent for pasture. The soils of this class show a greater diversity of physical characteristics than those of the First class. They are comparatively similar in their physical suitability for agricultural use, but they differ somewhat in productivity, workability, and conservability. Each soil of this group is moderately deficient in one or more of these characteristics, and the detrimental effect upon the physical suitability of the soil for agricultural use is greater than that of any of the First-class soils, but less than for any of the Third-class soils. These soils cover 3,830 acres. About 60 percent is used for crops; 10 percent is idle cropland; 15 percent is in pasture, and 15 percent is forest. The Second-class soils, listed by management groups, with the estimated percentage of each soil used for crops, idle cropland, open pasture, and forest in 1944, are given in table 5. Special crop adaptations, recommended rotations, and soil amendments are given in table 9.

TABLE 5.—*Estimated percentage of each Second-class soil in crops, idle cropland, open pasture, and forest in Mitchell County, N. C., in 1944, according to management groups*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
	Percent	*Percent*	*Percent*	*Percent*
GROUP 2–A:				
Clifton clay loam, eroded rolling phase	75	10	15	------
Edneyville loam	60	------	20	20
Fannin loam, rolling phase	15	10	10	65
Hayesville clay loam, eroded rolling phase	90	10	------	------
Watauga loam, rolling phase	35	10	10	45
GROUP 2–B:				
Tusquitee stony loam, rolling phase	20	10	70	------

MANAGEMENT GROUP 2–A

The soils of group 2–A are the eroded rolling phases of Clifton and Hayesville clay loams; Edneyville loam; Fannin loam, rolling phase; and Watauga loam, rolling phase. They are somewhat more sloping than the First-class soils and in general are less productive. Most areas are eroded. All the soils are at least moderately deep to bedrock and fairly permeable, the Clifton soil being somewhat less permeable than the rest. All are acid and respond to fertilization. The Clifton soil, however, is more fertile than the others and is a little less acid. Both the Clifton and Hayesville are more difficult to work inasmuch as they become more sticky when wet and harder when dry than do the other members of the group. All are suited to cultivation but require careful management to maintain their productivity at a relatively high level.

These soils are used for general farming; corn, small grain, and lespedeza are the principal crops. Systematic crop rotations are not commonly used, but on some farms corn is followed by small grains and lespedeza. In this rotation the first crop of lespedeza is cut for hay and the second is saved for seed or turned under. On a few farms a shorter rotation, consisting of corn, crimson clover, and corn, is followed consistently. Generally 200 to 300 pounds an acre of 4–12–4 or similar fertilizer mixture is used for corn. When available, manure is added to cornland in spring. Small grains receive about 300 pounds an acre of 16-percent superphosphate. On some farms a small quantity of lime is applied to cropland. The usual tillage practice is to break the land in spring. Rows are run the most convenient way; only a few farmers break and till the land along the contour.

Soils of this group, especially Clifton clay loam, eroded rolling phase, are suitable for alfalfa, wheat, barley, clover, and grass. Corn yields are fairly high when corn follows a leguminous crop that has been turned under and rainfall is sufficient. Judging from the growth and apparent yields of the few orchards on similar soils in this and nearby counties, apple orchards would probably give good returns.

Rotations suggested for soils of this group are for so-called general farming. Corn, small grain, and 2 years of lespedeza usually meet the requirements of average farms consisting in part of these Clifton,

Fannin, Hayesville, and Watauga soils. A 4-year rotation of alfalfa followed by corn, small grain, and 1 year of lespedeza gives excellent results on the Clifton soil. Alfalfa can also be grown on the Hayesville or Fannin soils, and the yields would be almost as good as on the Clifton soils. The alfalfa rotation is useful on dairy or beef cattle farms as it assures a sufficient quantity of high-quality feed each year. Only a few farms have enough acreage of any of these soils to permit such a long rotation; however, where the land is available at least a small plot of alfalfa should be grown.

The fertilizer requirements of these soils in general are moderately high, although the Clifton soils and, to some degree, the Hayesville and Fannin soils, are less exacting than are the Edneyville and Watauga. In preparing the land for alfalfa, approximately 2 tons an acre of ground limestone should be applied. A similar quantity probably will be needed during each rotation. Phosphate and potash should be added as needed. As the soils show a deficiency in boron in many places, small quantities should be supplied where needed.

Moderately heavy farming implements and good draft animals are necessary in breaking the land or turning under sod. Fields should be prepared for crops as early in spring as conditions permit. These soils, especially the Clifton and Hayesville, must be tilled within a narrow range of moisture conditions. In a few places they tend to puddle somewhat and bake if plowed or cultivated when too wet. Organic matter added to the soil will greatly lessen the possibility of puddling. It is not necessary to plow the soils deeply if sod-forming crops in the rotation are turned under.

The soils of this group are subjected to severe losses of water and soil material when kept in continuous row crops or where the crop rows are not run with the contour. Under such conditions water control is of primary importance. Such losses from the larger fields can be effectively controlled through the use of rotations in a system of contour strip cropping in which bands of close-growing crops, alternated with row crops, serve to slow down the runoff. In places terraces should be constructed. Permanent guide rows should be established in fields that are not terraced.

MANAGEMENT GROUP 2–B

Tusquitee stony loam, rolling phase, consisting of colluvial material at the bottom of slopes and around the heads of small streams, is the only soil of group 2–B. Many stones, ranging in size from small fragments to large boulders, are on the surface and in the soil mass. Owing to the moderately sloping relief and the high stone content, control of surface water is not difficult.

Corn, hay, and pasture grass are the principal crops. If the stones were removed, the soil would be favorable for intensive row cropping. Potatoes, many different vegetables, corn, tobacco, and small grains should do well. Rotations are not generally practiced; sometimes one row crop follows another, and often the same row crop will be grown on a field year after year. Some farmers alternate crops to a certain extent or even follow potatoes with rye or wheat and then lespedeza or clover for 2 years, or they may plant tobacco, followed by rye, lespedeza or clover, and then corn. Another rotation is corn, crimson clover, and corn. Legumes can be introduced into the rotation to help maintain high crop yields. Land for corn is generally treated

with about 200 pounds an acre of 0–16–0, and manure is added when available. Vegetable crops are fertilized heavily with 500 to 800 pounds of 6–8–6 or 4–12–4.

Inasmuch as soils suitable for crops are of very limited acreage in many places, considerable effort is commonly justified in removing stones to make the soil more suitable for intensive use. Such improvement facilitates lessening the cultivation of associated steeper soils not so well suited to tillage. Besides contour tillage and removal of stones, no special practices are necessary. Except for the stones, this soil is easily plowed and cultivated, and light implements are sufficient. Land is usually broken in spring for row crops, and the rows are laid out the most convenient way across the fields.

THIRD-CLASS SOILS

The Third-class soils are fair to good for agriculture. They are poor to fair for crops and fair to very good for pasture. Under prevailing or under more intensive farming practices, they are limited in physical suitability to the commonly grown crops, but none of the limitations is great enough to make them definitely unsuited physically to tilled crops. Among the limitations, or undesirable features, are strong slope; low plant nutrient and organic content; unfavorable texture, structure, or consistence; eroded condition; or inadequate natural drainage. These soils cover 9,729 acres. Approximately 35 percent is in crops; 5 percent, idle cropland; 15 percent, open pasture; and 45 percent, forest. The Third-class soils are listed by management groups, and the estimated percentage of each soil in crops, idle cropland, open pasture, and forest in 1944 is given in table 6. Special crop adaptations, recommended rotations, and soil amendments are given in table 9.

TABLE 6.—*Estimated percentage of each Third-class soil in crops, idle cropland, open pasture, and forest in Mitchell County, N. C., in 1944, according to management groups*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
	Percent	*Percent*	*Percent*	*Percent*
GROUP 3–A:				
Balfour loam, hilly phase	25	5	5	65
Clifton clay loam, hilly phase	10	------	5	85
Hayesville loam, hilly phase	------	------	------	100
Tusquitee loam, hilly phase	80	5	15	------
GROUP 3–B:				
Balfour loam, eroded hilly phase	65	15	20	------
Clifton clay loam, eroded hilly phase	65	5	30	------
GROUP 3–C:				
Worsham loam	35	10	45	10

MANAGEMENT GROUP 3-A

The soil of group 3–A—the hilly phases of Balfour, Hayesville, and Tusquitee loams, and of Clifton clay loam—have brown loam or clay

loam surface layers and moderately heavy brownish to reddish clay or sandy clay to clay loam subsoils. All have about the same relief, are well drained, and are about equally susceptible to erosion. These soils are not recognized as particularly suitable for any special crop, but they are commonly used for such general crops as corn, small grains, clover, and grass. There are no systematic crop rotations in general practice, but a corn-small grain-lespedeza rotation is followed on several farms, and some farmers alternate crops.

The most common amendment is 16-percent superphosphate applied at the rate of 200 to 300 pounds an acre for corn and 300 to 400 pounds for small grain. On a few farms corn is side-dressed with 10 to 15 pounds of nitrogen an acre. Manure is applied first to galled spots in fields and then to cornland in general. Very little lime is used. Special tillage practices are not employed, but the land is generally broken late in winter, and crop rows are run approximately along the contour in some fields. On a few farms hillside ditches with a sharp decline are run across the slope. With the exception of the Balfour soil, the physical properties of these soils, including their relatively high clay content and comparatively good water-holding capacity, render them especially desirable for alfalfa, clover, and wheat. These crops help conserve water and soil material, factors highly useful in an adequate soil-management program. Apple and other fruit trees are successful on all soils in this group, and the Balfour is well suited to the growth of cabbage, green beans, and other truck crops.

Suitable rotations for the Clifton, Balfour, Hayesville, and Tusquitee soils are (1) corn, small grain, and clover and grass meadows for 4 or 5 years and (2) alfalfa for 3 or 4 years, followed by corn, small, grain, and lespedeza. Truck crops on the Balfour soil may be followed by rye and then clover and meadow grasses. The range in moisture for tillage is narrow in the Clifton and Hayesville soils. If plowed when too wet, they have a tendency to puddle, bake, and form clods; if plowed too dry, they break into large clods and are difficult to till. Land broken in spring is probably more desirable for corn, unless fall-broken areas are left in a rough condition over winter.

MANAGEMENT GROUP 3–B

The eroded hilly phases of Balfour loam and Clifton clay loam form group 3–B. They have developed on hilly slopes over igneous and metamorphic rocks. They are well drained and moderately permeable. The Clifton soil has a reddish-brown surface soil and a brownish-red heavy sticky clay subsoil; whereas the Balfour has a brown surface and a brown fine sandy clay or friable clay subsoil. No particular recognition is given to the suitability of these soils for any special crop, but they are commonly used for such general farm crops as corn, small grain, clover, and grass. Systematic crop rotations are not in general practice. A corn-small grain-lespedeza rotation is used on several farms, and some crop alternation is practiced on nearly all farms.

The amendment most commonly used is 16-percent superphosphate, applied at the rate of 200 to 300 pounds an acre for corn and 300 to 400 pounds for small grains. In many places corn is side-dressed with 10 to 15 pounds of nitrogen an acre. Manure is applied first to galled or eroded areas in fields and then to cornland in general. Very little lime is used on the cropland, and no special tillage practices are em-

ployed. The land is generally broken late in winter; crop rows are run on the contour in most fields. On some farms hillside ditches are constructed, generally at a sharp gradient.

Despite its erosion the eroded hilly phase of Clifton clay loam has qualities that make it desirable for alfalfa, clover, and wheat. These crops help conserve water and soil material, factors which are highly important in an adequate soil-management program. Grass and hay crops also do well on the Clifton soil. Apple and other fruit trees, pasture, hay crops, and vegetables are successful on the Balfour soil.

A suitable rotation for the Clifton soil is alfalfa for 3 to 4 years, corn, small grain, and lespedeza. This rotation is desirable for a livestock farm as it assures adequate good quality hay. Other rotations, which are particularly suitable for Balfour soil, consist of corn, small grain, and a clover and grass meadow for 4 or 5 years—this being especially suited to general or subsistence farming—and truck crops (potatoes, green beans, cabbage), small grain, and hay for 4 or 5 years.

The range in moisture for tillage is narrow for the Clifton but broad for the Balfour soil. If the Clifton soil is plowed when too wet it has a much greater tendency to puddle, bake, and form clods than does the Balfour, and when it is too dry, tillage is difficult in many places with the implements and work animals commonly used. When broken in spring, both soils are probably more desirable for corn than when they are broken in fall, except when they are left in rough condition throughout the winter.

Unless proper precautions are taken, control of erosion soon becomes a major problem in the management of these soils, especially the Clifton. The more organic matter added—through rotations including legumes—the more retentive of moisture the soils become. Row crops should not be planted more than 1 year in every 4 or 5. It may be preferable to substitute barley for corn when feasible. As far as practicable, only the soils of the first bottoms and terraces, or the soils of the first two management groups, should be planted in corn. If row crops must be grown on the soils of this management class, a strip-crop rotation system is generally desirable. Such a system will require contour tillage and may be aided by terraces on the lesser slopes.

MANAGEMENT GROUP 3–C

Worsham loam, the only soil in group 3–C, has a smooth surface and poor internal drainage. Fine texture and heavy consistence make the subsoil locally known as pipe clay. Most of this soil has been cleared, and about equal proportions are used for crops and for pasture. It is probably better suited to sod for grazing or for hay than for crops. Corn is about the only tilled crop grown and in wet years even it is often drowned out.

Generally no amendments are used; land fenced as pasture is often left to produce what forage it will, but applications of lime and superphosphate would be very beneficial. Because of the heavy subsoil and the great quantity of seepage water from higher areas, adequate drainage is seldom possible, although open ditches help considerably.

FOURTH-CLASS SOILS

Fourth-class soils have certain physical characteristics that make them poorly suited to crops requiring tillage, but they are moderately productive of pasture plants. Each soil of this group is so difficult

to work or to conserve, or both, that its cultivation is not generally feasible. On the other hand, all of the soils are sufficiently productive under good management to maintain a moderately good to very good pasture. Although these soils are only poor to fair for general agricultural use, a considerable acreage is tilled. This use cannot well be avoided under present conditions, because there are only small areas of First-, Second-, or Third-class soils in many parts of the county. Their use for crops is recommended, however, only where there are no other soils on the farm that are better suited. Where adequate areas of fair to good cropland are available, most of the Fourth-class soils are used for pasture or forest.

The Fourth-class soils occupy 38,587 acres in the county. In table 7 they are listed by management groups, with the estimated percentage of each soil used for crops, idle cropland, open pasture, and forest in 1944. Special crop adaptations, recommended rotations, and soil amendments are given in table 9.

TABLE 7.—*Estimated percentage of each Fourth-class soil in crops, idle cropland, open pasture, and forest in Mitchell County, N. C., in 1944, according to management groups*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
GROUP 4–A:	*Percent*	*Percent*	*Percent*	*Percent*
Fannin loam:				
Hilly phase	------	------	------	100
Eroded hilly phase	85	10	5	------
Hayesville clay loam, eroded hilly phase	55	20	25	------
Watauga loam:				
Hilly phase	------	------	------	100
Eroded hilly phase	30	20	50	------
GROUP 4–B:				
Burton stony loam	------	------	85	15
Clifton stony clay loam, hilly phase	------	------	5	95
Porters stony loam, hilly phase	5	------	10	85
Rolling stony land (Clifton soil material)	------	------	60	40
Talladega loam, hilly phase	20	10	10	60
Tusquitee stony loam, hilly phase	------	------	------	100
GROUP 4–C:				
Ashe loam, steep phase	------	------	------	100
Ashe sandy loam, hilly phase	------	------	------	100
Clifton clay loam, steep phase	------	------	------	100
Hayesville loam, steep phase	10	10	10	70
Porters-Clifton loams, steep phases	------	------	------	100
Porters loam, steep phase	5	------	5	90
GROUP 4–D:				
Ashe loam, eroded steep phase	50	15	35	------
Clifton clay loam:				
Eroded steep phase	60	10	30	------
Severely eroded hilly phase	15	15	70	------
Hayesville clay loam, severely eroded hilly phase	30	10	60	------
Porters-Clifton loams, eroded steep phases	10	10	80	------
Porters loam, eroded steep phase	50	15	35	------
GROUP 4–E:				
Alluvial soils, undifferentiated	50	10	40	------
Stony colluvium (Porters soil material)	------	------	60	40

MANAGEMENT GROUP 4–A

The hilly and eroded hilly phases of Fannin and Watauga loams and the eroded hilly phase of Hayesville clay loam are the soils of group 4–A. They have a loamy surface, a moderately friable to moderately compact subsoil, and a depth to bedrock of more than 30 inches. They are relatively fertile and capable of responding to good management. All the soils composing the group have been cleared and cultivated and many have lost a large part of the surface soil by erosion. Some shortleaf pine has established itself in places.

No definite rotation is in general use, although some farmers alternate corn and small grain and a few add lespedeza so as to have a 4-year rotation. Lime is applied to hay and pasture land on a few farms and to cropland on some farms at the rate of 1 ton an acre every 4 or 5 years. Considerable superphosphate is used. Manure is added to these soils rather than to those less eroded, not only to increase crop yields, but also to help control water on the land.

Few special tillage practices are employed; land is generally plowed in spring. Hillside ditches are used on many fields, but frequently they have gradients of 8 to 20 percent and many have become active gullies. A few farmers have left strips of sod or other close-growing vegetation across the fields and thus have been fairly successful in controlling runoff. Mitchell County was one of the first in the mountainous area of the State to practice strip cropping. This came about largely as a result of necessity, since most of the suitable agricultural soils occupy hilly to steep relief.

These soils are not well suited to crops requiring tillage, chiefly because of the difficulty of preventing losses from erosion and the difficulty of working them. Good permanent pasture is feasible where proper management is practiced. In general this consists of liming at the rate of 1 to 2 tons an acre every 4 or 5 years, applying phosphoric acid at the rate of 75 to 100 pounds an acre every 3 years, seeding with a good pasture mixture, and keeping brush and weedy growth suppressed.

Some farmers need these soils for tillage crops. Areas cultivated should be planted in long rotations in which sod crops occupy the land for 5 out of 6 years. A rotation consisting of corn followed by wheat or rye seeded to a grass-legume mixture to be left for the following 4 years is among the better suited rotations. Adequate fertilization should be practiced, and fields should be arranged in contour strips with only a narrow band cultivated each year.

MANAGEMENT GROUP 4–B

Burton stony loam; the hilly phases of Clifton stony clay loam, Porters and Tusquitee stony loams, and Talladega loam; and Rolling stony land (Clifton soil material) are the soils of group 4–B. They are rolling to hilly, permeable, and either stony or shallow to bedrock. Little of their aggregate area is materially affected by erosion, although the stronger slopes are subject to erosion when tilled. The fertility of these soils ranges from low for the Talladega to moderately high for the Tusquitee.

Most of these soils are in forest; only a few small scattered areas

have been cleared and used for pasture or as cropland. No definite rotation is in general use on the cultivated areas, although some farmers alternate corn and small grain and a few add lespedeza so as to have a 4-year rotation. Contour tillage is the only special tillage practice employed. The land is usually plowed or broken in spring. A few farmers have laid out contour strips of sod crops alternating with row crops and thus have been successful in controlling runoff.

Steepness of slope, susceptibility to erosion, and high stone content make these soils unsuitable for tilled crops unless very carefully managed. Their most feasible use is permanent sod, principally for pasture. Any of these soils needed for corn and other row crops should be planted to a rotation in which the row crop is followed by wheat or rye, and then by a grass-legume mixture. Preferably such fields should be in sod-forming crops 5 out of every 6 years. Where they are planted in contour-strip rotations, however, only a narrow band should be broken and cultivated each year, and special attention should be given to any galled or severely eroded spots in the fields. These spots should be fertilized or manured and, if feasible, seeded to sod-forming crops.

MANAGEMENT GROUP 4–C

Most of the soils of group 4–C are loams with friable loam to clay loam subsoils. They have steep relief (30 to 60 percent) and are somewhat shallow to bedrock. The soils in this group are the hilly phase of Ashe sandy loam and the steep phases of Ashe, Hayesville, and Porters loams, Clifton clay loam, and Porters-Clifton loams. They are susceptible to accelerated erosion and may be considered as only moderately productive. Practically all areas should be left in forest, but those that are less steep make fair to good pasture if properly managed. As soon as possible after being cleared the land should receive 2 tons of ground limestone. Thereafter it may be given 1 ton every 4 or 5 years. From 75 to 100 pounds an acre of phosphoric acid at seeding and a similar application each 3 years will be necessary for adequate development of desirable sod.

MANAGEMENT GROUP 4–D

The soils of group 4–D are the eroded steep phases of Ashe and Porters loams, Clifton clay loam, and Porters-Clifton loams; and the severely eroded hilly phases of Clifton and Hayesville clay loams. They are fairly uniform in color and texture, ranging from yellowish-brown loam to reddish-brown friable clay loam. They are hilly or steep, relatively shallow to bedrock, and eroded. All areas have been cleared and cultivated, but at present about half are in pasture and a few are lying idle. Because of their strong slopes and resulting erosion losses, these soils are not suited to crops, but with proper management they furnish good grazing. Great care should be exercised to avoid overgrazing, which results in further sheet erosion and gullying.

None of these soils is more than moderately productive in its present state. Two tons an acre of ground limestone should be applied when grass mixtures are sown or as long before seeding as possible. One

ton of limestone should be applied every 5 or 6 years thereafter. An application of 100 to 125 pounds an acre of phosphoric acid will be necessary at or just before seeding, and like applications at intervals of 3 or 4 years. Similar treatment with lime and phosphate should be given established pasture that is in poor condition, and any manure available should be applied to the thinner spots.

MANAGEMENT GROUP 4–E

The two land types of group 4–E—Alluvial soils, undifferentiated, and Stony colluvium (Porters soil material)—consist of materials washed or sloughed from upland areas. They have a smooth surface and are deep to bedrock. Extreme stoniness and inadequate drainage or susceptibility to flooding, however, make them poorly suited to crops, although they are useful as pasture.

Alluvial soils, undifferentiated, consist of an intricate mixture of materials. Areas are low-lying, subject to frequent overflow, and have a high permanent water table. Drainage is difficult unless stream channels are deepened considerably, and the soil character is so varied that specific land use is uncertain. Open ditches may help drain some of the areas. Stony colluvium (Porters soil material) consists almost wholly of flat and rounded stony material ranging in size from gravel to boulders 2 feet or more in diameter with some soil material intermixed. The most feasible use is pasture or woodland.

In general, areas of these two soil materials that are now in forest should not be cleared. Open areas used as pasture may be treated with 2 tons of ground limestone and 75 to 100 pounds of phosphoric acid an acre at the time of seeding or to improve the stand of vegetation already on the land. Similar applications of phosphoric acid together with 1 ton of limestone should follow every 3 years.

FIFTH-CLASS SOILS

Fifth-class soils are poorly suited to cultivated crops or to pasture under almost any conditions. Their steepness, stoniness, shallow depth to bedrock, poor moisture relations, and scarcity of plant nutrients make tillage impractical or even impossible, and their use as pasture is generally not feasible. On farms having no better soil, the use of some Fifth-class soils for pasture or crops may be required, but the conservability and workability of these soils are unfavorable, and the yields generally low. Hand implements must be used in most places for preparing the seedbed and for cultivation. Although trees grow more slowly on many of these soils than on those of other classes, the Fifth-class soils are better suited to forest than crops of pasture.

Fifth-class soils occupy 79,881 acres in the county. The estimated percentage of each soil used for crops, idle cropland, open pasture, and forest in 1944 is given in table 8.

The Fifth-class soils are used mainly for forest. Most of their acreage will probably remain in forest for a long time, but at present little can be said about soil management practices for forest production, particularly from the farmers' point of view. These soils therefore have not been subdivided in groups according to soil management requirements and responses.

Although the Fifth-class soils are not physically well suited to crops and pasture, small areas are used for these purposes on farms where there is not enough better soil. This applies chiefly to the Chandler, Talladega, Porters, Ashe, and Clifton soils that are less steep, stony, or severely eroded. The Clifton soils are less fertile and require different treatment than most of the other soils of the class. Even

TABLE 8.—*Estimated percentage of each Fifth-class soil in crops, idle cropland, open pasture, and forest in Mitchell County, N. C., in 1944*

Management group and soil	Crops	Idle cropland	Open pasture	Forest
	Percent	*Percent*	*Percent*	*Percent*
Ashe loam:				
Eroded very steep phase	5	5	90	------
Very steep phase	------	------	20	80
Ashe stony loam	------	------	------	100
Chandler loam:				
Eroded steep phase	5	10	85	------
Severely eroded steep phase	------	40	60	------
Steep phase	------	------	------	100
Clifton clay loam, severely eroded steep phase	20	30	50	------
Clifton stony clay loam:				
Severely eroded steep phase	------	40	60	------
Steep phase	------	------	------	100
Porters loam:				
Eroded very steep phase	------	20	80	------
Severely eroded steep phase	------	40	60	------
Very steep phase	------	------	10	90
Porters stony loam:				
Eroded steep phase	------	------	100	------
Steep phase	------	5	5	90
Very steep phase	------	1	3	96
Ramsey stony loam:				
Steep phase	------	------	10	90
Very steep phase	------	------	------	100
Rock outcrop	------	------	------	100
Rough gullied land (Clifton and Talladega soil materials)	------	------	100	------
Rough stony land (Porters soil material)	------	------	------	100
Talladega clay loam:				
Severely eroded hilly phase	------	100	------	------
Severely eroded steep phase	------	100	------	------
Talladega loam, steep phase	------	------	------	100
Watauga loam, severely eroded hilly phase	------	45	55	------

the better Fifth-class soils have steep slopes (30 to 60 percent), are eroded in many places, and are low to moderate in fertility. It is expensive, if not impracticable, to maintain satisfactory yields of crops requiring tillage on these soils.

Where production of tilled crops is attempted, adequate liming, fertilizing, and every reasonable supporting practice for water control are needed. The use of amendments and careful selection and rota-

tion of crops are especially needed to encourage heavy vegetation. Strip cropping is usually required if productivity is to be maintained any length of time.

The addition of lime and fertilizer, particularly phosphorus, and use of other good management practices are required for maintenance of pasture. In general, legumes should make up a considerable part of the pasture sod, and the application of 1 to 1½ tons of ground limestone and 75 to 100 pounds of phosphoric acid an acre every 4 to 6 years is a good practice. Steep slopes and inaccessibility, however, make it difficult to apply these materials and also to control weeds in many places.

The reestablishment of vegetation on Rough gullied land (Clifton and Talladega soil materials) requires special attention and, because of the expense involved, is work that most farmers will do only gradually. Wherever feasible, ditches, terraces, or other measures should be taken to divert the water from the gullied areas. The soils should then be mulched and seeded with mixtures of lespedeza and suitable grasses. Kudzu or suitable tree seedlings, as shortleaf and white pines and black locust, might follow the sod to provide a more permanent cover. The less sloping phases of this land type might be prepared gradually for pasture.

The remaining Fifth-class soils are stony, steep to very steep, or severely eroded. With the exception of very small scattered patches that are used for other purposes for short periods, they are kept in forest. The management therefore involves only a few simple practices for protection from fire, trampling, and runoff.

SUITABLE CROPS, ROTATIONS, AND FERTILIZER REQUIREMENTS

Crop adaptation, fertilizer requirement per acre, and water control measures are given by management groups for the soils of Mitchell County in table 9.

Fertilizers recommended are listed on the basis of the nitrogen, phosphoric acid, and potash required by a given rotation within a particular management group. The following general principles should be kept in mind in applying plant nutrients to the rotations.

1. *Nitrogen.* Corn, small grains, and truck crops give best returns from direct applications, and most of that used in the rotation should be on these crops.
2. *Phosphoric acid.* The best response to applications of phosphate is usually made by applying this plant food to truck crops, small grains, and legumes, as clover and alfalfa. Most of the phosphate used in the rotation should therefore be used on these crops.
3. *Potash.* The best returns from applications of potash are generally shown on truck crops, small grains, legumes, and sometimes corn. It should be used, however, on most crops in the rotation.
4. *Limestone.* Legume crops, as lespedeza, clover, and alfalfa, give the best response to lime, especially if it is applied prior to seeding the legume, preferably to the crop just preceding it in the rotation. For example, where lespedeza or clover is to be seeded in small grain, the lime should be applied for the rotation when the land is prepared for the small grain.

Examples of the application of these principles in fertilizer rotations are given in table 10. They show some of the ways in which the recommended fertilization should be obtained. When straight phos-

TABLE 9.—*Crop adaptation, fertilizer requirements per acre, and water control measures by management groups for soils of Mitchell County, N. C.*

Management group and soil	Special crop adaptation	Rotations	Nitrogen	Phosphoric acid
			Pounds[1]	*Pounds*[1]
GROUP 1-A:				
Altavista sandy loam, Congaree fine sandy loam	Corn, grass, truck, pasture.	1. Corn, crimson clover, 1 year	15–20	25–40
		2. Corn, small grain, lespedeza, 2 years; with silage corn, 3 years.	30–50	70–100
		3. Truck (cabbage or beans), small grain, lespedeza, and grass hay, 3 years.	40–60	70–120
GROUP 1-B:				
State silt loam, Tate silt loam, Tusquitee loam: Rolling phase, Undulating phase	Corn, truck, clover, wheat, alfalfa, pasture, grass.	1. Corn, small grain, lespedeza, 3 years.	30–60	70–120
		2. Corn, small grain, clover and grass hay, 4–5 years.		
		3. Corn, crimson clover, 1 year	15–20	25–40
		4. Alfalfa, 4 years, corn, small grain, lespedeza, 6–7 years.	30–50	200–300
		5. Truck, small grain, clover or lespedeza, 3–4 years.	40–70	70–120
GROUP 1-C:				
Balfour loam, rolling phase, Clifton clay loam, rolling phase	Truck, wheat, alfalfa, corn, pasture, grass and clover, apples.	1. Truck, small grain, clover or lespedeza, 3–4 years	40–80	80–130
		2. Corn, small grain, lespedeza, 3 years.	40–80	80–130
		3. Alfalfa, 4 years; corn, small grain, lespedeza, 6–7 years.	30–50	200–300
GROUP 2-A:				
Clifton clay loam, eroded rolling phase, Edneyville loam, Fannin loam, rolling phase, Hayesville clay loam, eroded rolling phase, Watauga loam, rolling phase.	Small grain, grass and clover, alfalfa, apples, pasture.	1. Alfalfa, 4–6 years; corn, small grain, lespedeza, 7 to 9 years.	30–50	250–300
		2 Corn, small grain, lespedeza, 4 years.	50–80	80–130
		3. Corn, small grain, grass and clover hay 2–3 years or 3–5 years.		
GROUP 2-B:				
Tusquitee stony loam, rolling phase.	Apples, grass and clover, pasture.	Where necessary to cultivate use rotation 2 or 3 for group 2-A.	60–100	80–140
GROUP 3-A:				
Balfour loam, hilly phase, Clifton clay loam, hilly phase, Hayesville loam, hilly phase, Tusquitee loam, hilly phase.	Apples, grass and clover, pasture, small grain, alfalfa.	1. Alfalfa, 3–5 years; corn, small grain, lespedeza, 6–8 years.	20–40	200–300
		2. Corn, small grain, lespedeza, 4 years.	60–90	90–140
		3. Corn, small grain, grass and clover hay for 3 years, 4 or 5 years.		
		4. Truck, small grain, grass and clover hay for 3 years, 4 or 5 years.		
GROUP 3-B:				
Balfour loam, eroded hilly phase, Clifton clay loam, eroded hilly phase.	----do----	The same as 3-A, with legume or sod cover turned under before planting row crop in fall; leave rough.	70–100	90–140
GROUP 3-C.				
Worsham loam	Pasture, hay, corn	1. Corn, grass hay for 5–6 years	15–30	60–100
		2 Corn, pasture for 5–6 years		
GROUP 4-A:				
Fannin loam: Hilly phase, Eroded hilly phase, Hayesville clay loam, eroded hilly phase, Watauga loam: Hilly phase, Eroded hilly phase	Pasture, grass and clover, meadow, apples.	Where crops are necessary, corn or row crop followed by grass and clover hay for 2 years, pasture as long as possible before cropping again.	(2)	(2)
GROUP 4-B:				
Burton stony loam, Clifton stony clay loam, hilly phase, Porters stony loam, hilly phase, Rolling stony land (Clifton soil material), Talladega loam, hilly phase, Tusquitee stony loam, hilly phase.	----do----	Where crops are necessary, see group 4-A.	(2)	(2)

See footnotes at end of table.

TABLE 9.—*Crop adaptation, fertilizer requirements per acre, and water control measures by management groups for soils of Mitchell County, N. C.*

Potash	Lime	Manure	Water control	Remarks
Pounds[1]	*Tons*			
15–30 50–70 50–80	1 every 4 to 6 years or as indicated by soil test.	None; use on upland soils.	None	Nitrogen on corn and small grain at planting or as top dressing, or both; phosphate and potash on corn or small grain; most of fertilizer on rotated truck crops.
30–50 15–30 200–300 40–60	1 every 3 to 6 years; 2 initial on alfalfa; use soil tests as guide.	To corn and alfalfa.	Contour tillage	Boron on alfalfa; fertilizer on truck in rotation 5, no potatoes in rotation with alfalfa because of potato diseases.
40–70 40–70 200–300	1 every 4 to 6 years; 2 initial on alfalfa; use soil tests.	do	do	Boron on alfalfa; fertilizer to truck crop; orchards laid out on contour and cultivated in rotation 2 by tree-row strips for a few years.
250–300 50–70	1 every 4 to 6 years; 2 initial on alfalfa or as indicated by soil tests.	do	Contour tillage, terraces, strip cropping.	Boron on alfalfa; orchards laid out on contour and cultivated in rotation 3 by tree-row strips for a few years; rotation 3 with strip-cropping plan.
60–100	1 every 3 to 6 years	To corn	Contour tillage	Because of considerable leaching, lime requirement is probably higher than recommended.
200–300 50–80	1 every 3 to 5 years; 2 for alfalfa, initial or according to soil tests.	To alfalfa or corn.	Contour tillage, terraces on lesser slopes; strip cropping for rotations 2, 3, and 4.	Considerable acreage now in forest suitable for cropping in long rotations as indicated; orchards for a few years under a strip system with rotations 2, 3, or 4.
50–80	do	do	Strip cropping	If eroded, soil has been row-cropped too often.
35–50	2, or as indicated by soil test in the rotation.	None; use on upland soils.	Blind ditches or other drainage.	Too wet to cultivate except to control weeds.
(4)	1 every 3 to 5 years	To corn	Contour tillage, terraces on lesser slopes, strip cropping.	Subject to further erosion; preferable to handle lands that must be tilled in a strip crop system whereby only narrow bands are plowed and in row crop and as part of the rotation.
(4)	do	do	Contour tillage, strip cropping.	Stone content in most of these soils too high for successful tillage; sod crops, largely pasture, preferable; well-suited to apple orchards.

See footnotes at end of table.

TABLE 9.—*Crop adaptation, fertilizer requirements per acre, and water control measures by management groups for soils of Mitchell County, N. C.*—Con.

Management group and soil	Special crop adaptation	Rotations	Nitrogen	Phosphoric acid
			Pounds[1]	*Pounds*[1]
GROUP 4–C				
Ashe loam, steep phase	Pasture, grass and clover, meadow, apples.	Where crops are necessary, see group 4–A.	(2)	(2)
Ashe sandy loam, hilly phase.				
Clifton clay loam, steep phase.				
Hayesville loam, steep phase.				
Porters-Clifton loams, steep phases.				
Porters loam, steep phase.				
GROUP 4–D.				
Ashe loam, eroded steep phase	----do----	Not suited to tilled crops, but if cropping is required by farm economy see group 4–A.	(2)	(2)
Clifton clay loam:				
Eroded steep phase				
Severely eroded hilly phase.				
Hayesville clay loam, severely eroded hilly phase.				
Porters-Clifton loams, eroded steep phases				
Porters loam, eroded steep phase.				
GROUP 4–E.				
Alluvial soils, undifferentiated.	Pasture, grass and clover meadow.	----------	30–50	60–90
Stony colluvium (Porters soil material).				
GROUP 5:				
Ashe loam:				
Eroded very steep phase.				
Very steep phase				
Ashe stony loam				
Chandler loam				
Eroded steep phase				
Severely eroded steep phase				
Steep phase				
Clifton clay loam, severely eroded steep phase.				
Clifton stony clay loam				
Severely eroded steep phase				
Steep phase				
Porters loam:				
Eroded very steep phase				
Severely eroded steep phase.				
Very steep phase	None, all wooded areas should remain in trees.	----------	----------	----------
Porters stony loam				
Eroded steep phase				
Steep phase				
Very steep phase				
Ramsey stony loam:				
Steep phase				
Very steep phase				
Rock outcrop				
Rough gullied land (Clifton and Talladega soil materials)				
Rough stony land (Porters soil material).				
Talladega clay loam:				
Severely eroded hilly phase.				
Severely eroded steep phase.				
Talladega loam, steep phase.				
Watauga loam, severely eroded hilly phase.				

[1] See section on Suitable Crops, Rotations, and Fertilizer Requirements. Examples: 15 to 20 pounds nitrogen is equivalent to 94 to 125 pounds nitrate of soda; 25 to 40 pounds phosphoric acid is equivalent to 125 to 200 pounds of 20-percent superphosphate, 15 to 30 pounds potash is equivalent to 30 to 60 pounds of 50-percent muriate of potash.

TABLE 9.—*Crop adaptation, fertilizer requirements per acre, and water control measures by management groups for soils of Mitchell County, N. C.*—Con.

Potash	Lime	Manure	Water control	Remarks
Pounds[1]	*Tons*			
(4)	1 every 3 to 5 years	To corn	Strip cropping	Too susceptible to erosion for cropping, pasture eventual use of all cleared areas of these soils.
(4)	do	do	do	Severely eroded condition indicative of need for strict water control measures; most areas should be in permanent sod; gullied areas, in trees, land necessary for tillage in a strip crop rotation system—see group 4-A.
40–60	do	None; use on upland soils.	Some drainage needed for many areas of alluvial soils	Stony colluvium subject to leaching, better drained spots of alluvial soils to be handled as group 1-A.
				Cleared areas where a satisfactory sod can be maintained should be in pasture, other areas in white pine or locust seedlings.

[3] 60–90 on row crop or at seeding of meadow or pasture if none in crop and each 3 to 5 years.
[3] 90–140 on row crop or at seeding if none in crop and each 3 to 5 years.
[4] 50–80 on row crop or at seeding if none in crop and each 3 to 5 years.
[5] 60–120 on row crop or at seeding if none in crop and each 3 to 5 years.

phate and potash materials are available they may be used, and their use should be taken into account in the application of complete fertilizer on the other crops of the rotation.

TABLE 10.—*Fertilizer recommendations for two crop rotations in management groups 1–A and 1–B, for Mitchell County, N. C.*

ROTATION 3, MANAGEMENT GROUP 1–A

Rotation	Fertilizer mixture	Nitrogen	Phosphoric acid	Potash
	Pounds per acre	*Pounds per acre*	*Pounds per acre*	*Pounds per acre*
Cabbage	700 of 6–8–6	42	56	42
Small grain	200 of 0–14–7	0	28	14
	100 of 16–0–0 [1]	16	0	0
Lespedeza and grass	None [2]			
Total		58	84	56

ROTATION 2, MANAGEMENT GROUP 1–B

Corn	200 of 6–8–6	12	16	12
	100 of 16–0–0 [3]	16	0	0
Small grain	300 of 3–12–6	9	36	18
	100 of 16–0–0 [1]	16	0	0
Clover and grass	200 of 0–14–7	0	28	14
Total		53	80	44

[1] Apply as top dressing in spring.
[2] If lime is needed, apply when preparing land for small grain.
[3] Apply as side dressing at last cultivation.

AGRICULTURAL PRACTICES

Cropland is broken in spring, usually in March and April, except on south-sloping land, which is generally broken in November and December. Contour tillage is often practiced on steep land, and strip cropping is becoming a common practice in a few localities. Practically none of the land has been terraced and, because of the prevailing steep slopes, terraces generally are not recommended. There is little poorly drained land, and much of this has been artificially drained. Open ditches or covered box-type ditches made of poles and slabs or rocks are used to remove excess water.

Crop rotations are used on some farms. Of those used on soils of the bottom lands, stream terraces, and colluvial slopes, one consists of potatoes, followed by rye for the first year; second year, rye turned under and followed by corn then rye; third year, lespedeza; and fourth year, potatoes. A second is corn followed by rye and lespedeza, these by lespedeza, then corn. In a third rotation tobacco is followed by rye and corn. In some places the rotation is corn, crimson clover, and corn; in others, rye, corn, and rye. In a few communities corn is followed by corn year after year. Rotations practiced on the Clifton,

Fannin, Hayesville, and Watauga soils include either small grain and lespedeza, followed by corn; or red clover followed by corn. Rotations sometimes used on the Ashe and Edneyville soils are corn, followed by grass and clover for 2 years, and then cabbage or potatoes; snap beans, followed by rye and clover for 2 years, and then cabbage, followed by corn; or corn, followed by rye or by grass and clover, and then by potatoes, cabbage, or snap beans. The rotations on Porters and Balfour soils include corn for 1 or 2 years, followed by a mixture of grass and clover, which is used the first year for hay and then 3 or 4 years for pasture.

Usually in the production of grass and clover, the crops are cut the first summer for hay and then grazed for 2 years, or until the land is again cultivated. Grasses, clover, and rye are seeded late in July or in August in crops that are harvested in fall. Lespedeza is generally seeded in small grain in spring.

Commercial fertilizer is used throughout the county in the production of practically all crops. The heaviest applications are to land used for truck crops. Applications range from 800 to 1,000 pounds, and the grades generally used are 6–8–6 or 4–12–4. Superphosphate, the principal fertilizer used for corn and small grain, is applied in quantities of 200 to 300 pounds an acre for corn and 300 to 400 pounds for small grain. A few farmers apply 200 to 300 pounds of 4–10–6, 5–10–5, or 4–12–4 to corn and wheat. Some phosphate fertilizer is applied to pasture at the rate of about 300 pounds of 16-percent grade or its equivalent.

Practically all the manure used is applied at the rate of 5 to 6 tons an acre, either in spring to eroded places in cornland or in fall to eroded areas in small-grain land. In some sections manure is applied to land to be used for truck crops; very little or none is used on pasture.

The use of lime has gradually increased. Some is used on truck crops, some on subsistence crops, and a little on the lower slopes or smoother areas of pasture land. The usual initial application of lime is 1 to 2 tons an acre; although soils on the bottom lands may receive as much as 2 to 4 tons.

Practices that control water on the land also aid in increasing crop production. Soil management on many farms is below that which is desirable. Crop rotations, including leguminous sod-forming crops, and the use of mineral amendments, as lime, nitrogen, phosphorus, and potash, are among the more important management practices stressed for most soils.

Dates on which crops in the country are planted and harvested are given in table 11.

SOIL PRODUCTIVITY

Soil productivity refers to the capacity of the soils to produce crops. Average acre yields that may be expected from various crops on each soil in the county are shown in table 12. Two yield levels are given for the crops on each soil, corresponding to probable production under two different kinds of treatment (columns A and B). Yields vary among soils, depending on soil characteristics, management, and crops.

Most of the farmers in the county make some effort to improve their land, either by adding manure or small quantities of commercial fertilizer or by occasionally changing fields and crops. In columns A the crop yields listed are those the average farmer obtains under the

TABLE 11.—*Planting and harvesting dates of the principal crops in Mitchell County, N. C.*

Crop	Date of planting	Date of harvesting
Corn	Apr. 15–30	Oct. 15–30.
Oats	Mar. 30–Apr. 15	July 1–15.
Wheat	Oct. 10–30	June 15–30.
Rye	Oct. 15–30	Apr. 1–15 (turned under).
Potatoes	Mar. 15–30	Sept. 1–15.
Grass	Feb. 20–Apr. 15 and July 15–Aug. 30.	Apr. 1–Oct. 30.
Clover	Apr. 1–15 and July 15–Aug. 30.	July 1–30 (hay).
Lespedeza	Apr. 1–15	Sept. 1–15 (hay).
Cabbage (beds seeded)	Apr. 10–20	
Cabbage (transplanted)	May 15–30	Sept. 1–30.
Green beans	May 1–July 30	July 1–Sept. 30.
Tobacco (beds seeded)	Feb. 15–25	
Tobacco (transplanted)	May 15–30	Aug. 15–Sept. 15.
Pasture mixtures	Mar. 1–Apr. 1	Apr. 1–Oct. 30 (grazed).

prevailing soil-management practices. These practices are not the same on all soils, nor in all agricultural districts of the county. For statements of management under which yields in columns A are obtained see discussions in the several management groups in the section on Use Classes and Management Groups of Soils.

Yield data in columns A are based on information secured from individual farmers throughout the county and from the county agricultural agent and other agricultural leaders. Specific crop yields on soil types for periods of several years and information about the carrying capacity of pasture for each soil commonly used for grazing were obtained from a few farmers.

The crop yields listed in columns B are those actually obtained by some of the more progressive farmers. They are possible of attainment and represent expected yields under good soil management, which involves the selection of suitable crops and rotations; the correct use of commercial fertilizer, lime, and manure; the return of organic matter to the soil; proper tillage; and where necessary, engineering measures for the control of water on the land. Yields in columns B may be considered as production goals that can be reached by feasible management practices; the same goal may be reached by one or by several different combinations of management practices. The choice of practices to be used on any single farm depends upon the farm business as a whole. On one farm it may be practical to manage the soil so that yields exceed that goal; on another it may not be practical to reach the goal. The best feasible management for a farm unit may give yields in excess of the goal for one crop and soil, and yields below the goal for another crop on the same soil.

Although knowledge about good management required by specific soils for certain crops is limited, some deficiencies in the soils are known and others are considered probable. From this knowledge some of the good practices required are discussed in the section on Use Classes and Management Groups of Soils and reference may

TABLE 12.—*Estimated average acre yields of the principal crops on the soils of Mitchell County, N. C., under two levels of soil management, and the conservability,[1] workability,[2] and use class[3] of each soil*

Yields in columns A are those to be expected under soil-management practices followed by the majority of farmers; those in columns B are to be expected from soil-management practices considered the best that the majority of farmers can feasibly follow]

Soil	Corn		Wheat		Rye		Clover and grass hay		Lespedeza hay		Potatoes		Cabbage for truck		Permanent pasture		Conservability	Workability	Use class
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B			
	Bu.	*Bu.*	*Bu.*	*Bu*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu*	*Bu*	*Tons*	*Tons*	*Cow-acre-days*[4]	*Cow-acre-days*[4]			
Alluvial soils, undifferentiated[5]	(6)	(7)	(6)	(6)	(6)	(6)	(6)	(7)	(6)	(6)	(6)	(6)	(6)	(6)	60	90	Very good	Poor	Fourth.
Altavista sandy loam	25	60	10	20	14	20	1.0	1.5	(7)	(7)	120	160	(7)	(7)	60	90	Excellent	Excellent	First.
Ashe loam:																			
Eroded steep phase[6]	10	23	(6)	(6)	6	10	.4	.8	0.3	0.6	60	90	4	8	35	70	Fair	Poor	Fourth.
Eroded very steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[9]15	40	Very poor	Very poor	Fifth.
Steep phase	12	25	(6)	(6)	7	12	.5	.9	.4	.7	(7)	(7)	5	8	40	70	Fair	Poor	Fourth.
Very steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[9]20	50	Very poor	Very poor	Fifth
Ashe sandy loam, hilly phase	(6)	(6)	(6)	(6)	(6)	(6)	.3	.5	(6)	(6)	(6)	(6)	(6)	(6)	[9]20	40	Fair	do	Fourth.
Ashe stony loam	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	Poor	do	Fifth.
Balfour loam:																			
Eroded hilly phase	18	50	10	18	8	18	8	1.3	.6	1 0	100	160	6	8	50	100	Good	Good	Third.
Hilly phase	20	50	10	18	9	18	.9	1.4	.7	1.0	100	160	6	8	60	100	do	do	Do.
Rolling phase	25	60	12	20	11	20	1.0	1.6	.8	1 2	120	180	6	9	65	105	Very good	Excellent	First.
Burton stony loam	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	65	90	do	Poor	Fourth.
Chandler loam:																			
Eroded steep phase	6	(6)	(6)	(6)	4	(6)	.3	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[9]20	50	Very poor	Very poor	Fifth.
Severely eroded steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[9]10	40	do	do	Do.
Steep phase	(7)	(7)	(6)	(6)	(6)	(6)	(6)	(7)	(6)	(6)	(6)	(6)	(6)	(6)	(7)	(7)	do	do	Do.
Clifton clay loam:																			
Eroded hilly phase	12	30	12	20	10	18	.6	1.2	.4	.8	40	70	(6)	(6)	45	80	Fair	Good	Third
Eroded rolling phase	25	60	18	28	12	20	1.0	1.6	.8	1.2	100	150	(6)	(7)	50	100	Good	Very good	Second.
Eroded steep phase	6	(6)	4	(6)	4	(6)	.3	.6	.3	.5	(6)	(6)	(6)	(6)	[9]20	50	Poor	Fair	Fourth.
Hilly phase	15	30	14	20	12	20	.8	1.4	.7	1.0	50	80	(6)	(6)	60	90	Good	Good	Third.
Rolling phase	30	60	20	30	14	24	1.2	1.8	1.0	1 4	120	160	(6)	(7)	60	105	Very good	Excellent	First.
Severely eroded hilly phase	8	(6)	5	(6)	4	(6)	.4	.8	.3	.6	(6)	(6)	(6)	(6)	[9]30	45	Poor	Fair	Fourth.
Severely eroded steep phase	5	(6)	4	(6)	4	(6)	.3	.5	.2	.5	(6)	(6)	(6)	(6)	[9]10	40	Very poor	Poor	Fifth.
Steep phase	(6)	(6)	(6)	(6)	(7)	(7)	(7)	(7)	(6)	(7)	(6)	(6)	(6)	(6)	(7)	(7)	Poor	Fair	Fourth.
Clifton stony clay loam:																			
Hilly phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[9]10	35	Fair	Poor	Do.
Severely eroded steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[9]10	25	Very poor	Very poor	Fifth.
Steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[9]10	30	Fair	do	Do.
Congaree fine sandy loam[5]	40	70	14	18	14	20	1.3	2.0	(7)	(7)	120	180	8	14	60	100	Very good	Excellent	First.
Edneyville loam	20	40	10	18	10	18	.8	1.3	.7	.9	(7)	(7)	(7)	(7)	60	100	do	do	Second.

See footnotes at end of table.

848826—52——5

TABLE 12.—*Estimated average acre yields of the principal crops on the soils of Mitchell County, N. C., under two levels of soil management, and the conservability,[1] workability,[2] and use class[3] of each soil*—Continued

[Yields in columns A are those to be expected under soil-management practices followed by the majority of farmers, those in columns B are to be expected from soil-management practices considered the best that the majority of farmers can feasibly follow]

Soil	Corn		Wheat		Rye		Clover and grass hay		Lespedeza hay		Potatoes		Cabbage for truck		Permanent pasture		Conservability	Workability	Use class
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B			
	Bu.	*Bu.*	*Bu*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu*	*Tons*	*Tons*	*Cow-acre-days*	*Cow-acre-days*			
Fannin loam:																			
Eroded hilly phase	8	(6)	7	(6)	7	(6)	.3	.6	.3	.5	(6)	(6)	(6)	(6)	40	80	Poor	Fair	Fourth.
Hilly phase	(6)	(7)	(6)	(7)	(6)	(7)	(7)	(7)	(6)	(7)	(6)	(7)	(6)	(7)	(7)	(7)	Fair	do	Do
Rolling phase	20	40	10	18	10	18	.8	1.3	(7)	(7)	(7)	(7)	(7)	(7)	60	90	Good	Very good	Second.
Hayesville clay loam:																			
Eroded hilly phase	8	16	7	13	5	11	.4	.8	.3	6	(6)	(6)	(6)	(6)	30	65	Poor	Fair	Fourth.
Eroded rolling phase	18	40	10	18	9	16	(7)	(7)	(7)	(7)	(6)	(6)	(6)	(6)	60	90	Good	Very good	Second.
Severely eroded hilly phase	6	(6)	4	(6)	3	(6)	.2	(6)	.2	(6)	(6)	(6)	(6)	(6)	20	40	Poor	Poor	Fourth.
Hayesville loam:																			
Hilly phase	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(6)	(6)	(6)	(6)	(7)	(7)	Good	Good	Third.
Steep phase	8	14	6	10	6	10	.6	1.0	(7)	(7)	(6)	(6)	(6)	(6)	40	70	Poor	Fair	Fourth.
Porters-Clifton loams:																			
Eroded steep phases	10	(6)	6	(6)	5	9	.4	.8	.3	.7	(6)	(6)	(6)	(6)	40	70	do	Poor	Do.
Steep phases	(6)	(6)	(6)	(6)	(6)	(6)	(7)	(7)	(7)	(7)	(6)	(6)	(6)	(6)	(7)	(7)	Fair	do	Do.
Porters loam:																			
Eroded steep phase	12	22	6	(6)	5	10	.5	1.0	.4	.8	(6)	(6)	(6)	(6)	50	90	Poor	Fair	Do.
Eroded very steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[8] 20	50	Very poor	Very poor	Fifth.
Severely eroded steep phase	10	(6)	6	(6)	5	(6)	.4	.7	.3	.6	(6)	(6)	(6)	(6)	30	75	do	Poor	Do.
Steep phase	14	(6)	7	(6)	8	(6)	.6	1.0	.5	.9	(6)	(6)	(6)	(6)	60	90	Fair	Fair	Fourth.
Very steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	30	60	Very poor	Very poor	Fifth.
Porters stony loam:																			
Eroded steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[8] 20	50	do	do	Do.
Hilly phase	12	(6)	(6)	(6)	(6)	(6)	.4	.8	.4	.7	(6)	(6)	(6)	(6)	40	70	Fair	Poor	Fourth.
Steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[8] 30	50	Very poor	Very poor	Fifth.
Very steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[8] 15	(6)	do	do	Do.
Ramsey stony loam:																			
Steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[8] 20	(6)	do	do	Do.
Very steep phase	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	do	do	Do.
Rock outcrop	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	do	do	Do.
Rolling stony land (Clifton soil material)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[8] 20	40	Fair	do	Fourth.
Rough gullied land (Clifton and Talladega soil materials).	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	[8] 5	(6)	Very poor	do	Fifth.
Rough stony land (Porters soil material)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	do	do	Do.

See footnotes at end of table.

State silt loam	40	70	15	25	15	22	1.1	2.0	1.0	1.5	120	180	10	15	90	110	Excellent	Excellent	First.
Stony colluvium (Porters soil material)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	40	55	Good	Very poor	Fourth.
Talladega clay loam:																			
Severely eroded hilly phase	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	[9] 10	(5)	Very poor	Poor	Fifth.
Severely eroded steep phase	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	do	Very poor	Do.
Talladega loam:																			
Hilly phase	12	20	8	15	8	14	.5	.8	.4	.7	(5)	(5)	(5)	(5)	40	80	Fair	Fair	Fourth.
Steep phase	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	Very poor	Poor	Fifth.
Tate silt loam	35	65	12	22	12	20	1.0	1.5	.8	1.2	100	150	7	12	80	100	Very good	Very good	First.
Tusquitee loam:																			
Hilly phase	25	45	10	15	10	16	.6	1.0	.5	.9	80	130	6	10	70	90	Good	Good	Third.
Rolling phase	35	65	12	25	12	22	1.0	1.5	.8	1.2	100	150	7	14	80	100	Very good	Very good	First.
Undulating phase	40	70	15	25	15	24	1.1	2.0	1.0	1.5	120	180	8	14	90	110	Excellent	Excellent	Do.
Tusquitee stony loam:																			
Hilly phase	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(7)	Good	Poor	Fourth.
Rolling phase	18	45	10	18	10	18	.5	.9	(5)	(7)	(5)	(7)	(5)	(7)	50	80	Very good	Good	Second.
Watauga loam:																			
Eroded hilly phase	8	(5)	7	(5)	7	(5)	.3	.6	.3	.5	(5)	(5)	(5)	(5)	40	80	Poor	Fair	Fourth.
Hilly phase	(5)	(7)	(5)	(7)	(5)	(7)	(7)	(7)	(7)	(7)	(5)	(7)	(5)	(7)	(5)	(7)	Fair	do	Do.
Rolling phase	20	40	10	18	10	18	.8	1.3	.7	.9	(7)	(7)	(7)	(7)	60	90	Good	Very good	Second.
Severely eroded hilly phase	5	(5)	(5)	(5)	4	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	[9] 10	(5)	Very poor	Poor	Fifth.
Worsham loam	10	25	(5)	(5)	8	15	.5	1.0	.5	1.0	(5)	(5)	(5)	(5)	50	80	Good	Good	Third.

Conservability refers to the ease with which productivity and workability can be maintained. It includes as major considerations the ease of conservation of soil material and plant nutrients and the ease of maintenance of good tilth. The relative terms—excellent, very good, good, fair, poor, and very poor—are used with respect to conservability for crops that require tillage.

Workability refers to the ease of tillage, harvesting, and other field operations. Texture, structure, consistence, organic content, moisture conditions, stoniness, and slope affect workability. Relative terms in the decreasing order of farming operations are excellent, very good, good, fair, poor, and very poor.

Classification according to relative suitability of soils for agriculture. First-class soils are those especially well suited physically to the crops generally grown, whereas Fifth-class soils represent those for the most part poorly suited physically to crop use.

[4] Cow-acre-days, used to express the carrying capacity of pasture land, is the product of the number of animal units carried per acre multiplied by the number of days that animals can be grazed without injury to the pasture; for example, a soil that supports 1 animal unit per acre for 360 days rates 360, a soil supporting 1 animal unit on 2 acres for 180 days rates 90; and a soil supporting 1 animal unit on 4 acres for 100 days rates 25.

[5] High water causes damage every third to fifth year.

[6] Crop is not commonly grown, the soil being poorly suited physically to its production under the management specified.

[7] Crop is not commonly grown, but the soil is physically suited to its production, although less well suited than to crops for which yields are given.

[8] Uneroded areas are practically all under forest cover.

[9] Current practices include practically no pasture treatment.

be made to it for the definition of the management level for yields in columns B.

Since different crops require different treatment on the same soil, so also requirements of the same crop on dissimilar soils may be unlike. Then, too, there is the point at which the farmer no longer finds it profitable to intensify further the management practices by which higher yields are obtained. This level depends on the soil and the crop, as well as on the other soils, crops, and industries on the farm; on prices; and on many other factors. It is not possible to define fully the practical limits of production because of insufficient knowledge and the uncertainty of these limits.

AGRICULTURE [7]

EARLY AGRICULTURE

Prior to the settlement by white men of the territory in which Mitchell County is located, Indians carried on a crude form of agriculture. Crops were planted and harvested, and game was hunted for meat and skins. Patches of corn and other crops, located on bottom lands or the smoother lands in coves, were small, however, and the Indians depended largely on game and fish for subsistence.

The early settlers carried on a type of agriculture somewhat like that which the Indians followed. They planted only enough to supply themselves with food and depended on livestock, hunting, and Indian trade for the other things they needed. The small cleared tracts, chiefly on the uplands, were farmed until the natural fertility was practically exhausted. Other areas were then cleared, and abandoned fields were left to grow up in trees.

Cattle raising was established early and soon became an important part of the agriculture, especially where there were many glades. When grazing lands became scarce because of the increase in population, growing cash crops replaced cattle raising to some extent. Early agriculture included the production of corn, wheat, oats, rye, buckwheat, and potatoes. Barley, sweetpotatoes, and tobacco were minor crops; livestock and poultry were produced for home use or local trade.

As roads became available for the transportation of agricultural products to markets, more land was cleared and used for cultivated crops until now most of the land suitable for agriculture has been cleared and is in use. A considerable part of all cleared land, however, is not suitable for tilled crops because of its steepness and susceptibility to erosion. If the timber and mining industries did not supplement agriculture, the county would have a smaller population, since the income provided by farming alone would be insufficient to support the number of persons now living there.

CROPS AND LIVESTOCK

Present agriculture consists mainly in the production of corn, wheat, rye, oats, hay, and forage as subsistence crops and cabbage, snap beans, potatoes, and tobacco as the principal cash crops. Almost every farm produces garden vegetables, potatoes, and sweetpotatoes for home consumption. Practically all the farms have a few apple trees,

[7] See footnote 5, p. 41.

and some have cherry, pear, or peach trees and small fruits. There are two large commercial apple orchards. In 1944, 401 farms reported growing vegetables for sale and 1,312 reported livestock sold or traded. Considerable forest products also are prepared for marketing. About 65 percent of Mitchell County is covered by forest, a great part of which is on Porters, Ashe, and Ramsey soils of the mountain uplands. Three-fourths of the original forest was oak-chestnut.

No one crop dominates the agriculture of the county. Corn, wheat, and hay are grown in all agricultural sections, but their distribution is largely determined by the character of the soil and slope of the land. Since the relief of the south-central part of the county is smoother than that of other parts and the soils are more favorable for agriculture, this area is somewhat better suited to the various row crops. Even so, much of this area is hilly to steep, while a large part of the county is occupied by high rugged mountains. Generally, a close relation is evident between the character of the soil and the crop grown.

The agriculture of the county depends largely on a few alluvial and colluvial soils, the Tate, Tusquitee, Congaree, State, and Altavista, which, although of small total extent, are very important and are used for crops. The principal upland agricultural soils are the smoother and less stony members of the Clifton, Hayesville, and Porters series, and most of the Balfour, Edneyville, Fannin, and Watauga soils. In general, crop yields are notably higher on the alluvial and colluvial soils than on those of the upland, and they are used more continuously for crops.

The steeper lands and many of the eroded phases are used mostly for pasture. These areas are sometimes cultivated to eliminate weeds or cropped if the operators have no other suitable land. The general practice on farms that include both steep and relatively smooth land is to crop the less steep fields and use the remaining areas for pasture. The control of runoff and erosion is considerably modified by this system. Since many farms, however, have only hilly or steep lands, the soil loss on these is great because of the difficulty in controlling runoff.

The acreage of the principal crops and number of bearing fruit trees and grapevines in stated years are given in table 13.

Hay (mixed clover and grass, lespedeza, alfalfa, timothy, other grass alone, or wild grasses) is grown on most of the agricultural soils. In 1944 hay crops occupied the largest total acreage (9,931 acres) in the county. The average acre yield of all hay, exclusive of sorghums, was 0.9 ton. Most farms produce sufficient hay for the work animals and generally for the cattle, but there is little if any to sell. It is used locally to feed cattle in winter and also for work stock.

Corn is grown on every available soil, but yields are often low because of the relatively low natural content of mineral plant nutrient materials and of organic matter and because so little fertilizer is applied. Practically all the corn produced is used for feeding work animals and cattle and for fattening hogs, although some is ground into meal for domestic use. A local demand always exists for any

TABLE 13.—*Acreage of the principal crops and number of bearing fruit trees and grapevines in Mitchell County, N. C., in stated years*

Crop	1919	1929	1939	1944
	Acres	*Acres*	*Acres*	*Acres*
Corn:				
For grain	8,215	7,637	7,612	6,250
For silage	2,238	[1]	12	[1]
Hogged, grazed, or cut for fodder	[1]	14	36	[1]
Oats, threshed	2,124	242	206	40
Wheat	3,764	622	401	114
Barley	[1]	3	44	7
Rye	150	92	297	61
Buckwheat	23	16	[1]	[1]
All hay	6,502	7,816	6,860	9,931
Alfalfa	2	6	12	40
Lespedeza	[1]	[1]	316	873
Legumes cut for hay	23	106	42	[1]
Small grains cut green	275	54	310	36
Clover and timothy, alone or mixed	4,734	5,570	3,622	6,182
Other tame or cultivated grasses	1,446	2,067	2,405	2,793
Wild, salt, or prairie grasses	22	13	153	7
Potatoes	546	743	1,374	1,278
All other vegetables	121	188	242	345
Sorghum for sirup	439	57	62	[1]
Tobacco	14	84	218	436
	Number	*Number*	*Number*	*Number* [2]
Apples—trees	67,085	70,458	63,493	53,234
Peaches—do	3,759	5,653	1,420	190
Grapevines	1,491	1,119	3,104	1,675

[1] Data not available.
[2] Includes bearing and nonbearing trees and vines.

excess. Only a small quantity of it is hogged, grazed, cut for fodder, or produced for silage. The average yield of 32.9 bushels an acre in 1944 was higher than in previous census years. Best yields are generally obtained on Tusquitee loam. This soil, which occurs at or near the base of some mountains, contains a relatively high quantity of organic matter and normally has a favorable moisture content. Other good corn soils are Congaree, Altavista, Balfour, State, and Porters.

Potatoes had the third highest acreage in 1944, when 1,750 farms reported 1,278 acres with a yield of 129,879 bushels. Farm families use a large part of the potato crop, and the rest is sold on commercial markets.

Although burley tobacco is fourth from the standpoint of acreage planted, it is grown on the best soils in the county and receives preference over all other crops in the use of manure and fertilizer, cultivation, and harvesting. Entirely a cash crop, it was grown on 539 farms in 1939, but the total acreage was only 436, or an average of about 0.8 acre a farm. Tobacco is generally marketed in Boone, West Jefferson, of Asheville, N. C., or Johnson City, Tenn.

Wheat, generally grown on the fine-textured soils, as Clifton, Hayesville, and Fannin, is used on the farms for flour and feed. Not enough, however, is grown to supply all local needs for flour; so much wheat,

bread, and flour has to be shipped into the county. Rye occupied a total of 61 acres on 30 farms in 1944. The grain is threshed and saved for seeding land for soil-improving purposes. Much of the crop is grazed before being allowed to produce grain. Oats for grain were produced on 40 acres in 1944. The minor field crops, buckwheat and barley, are grown on a variety of soil and slope conditions, but only on a few farms.

A considerable acreage of truck crops is grown, generally on friable loam soils. Some vegetables are used on the farms and the rest are sold on local markets. Beans are usually marketed at Mountain City, Tenn., and cabbage is trucked to southern Georgia or Florida.

In 1944 the total area of permanent and plowable pasture was 7,805 acres. There is pasture on almost all the soils in the county, but the larger areas are on Porters, Clifton, and Ashe soils. Pasture mixtures used on Porters soils include Kentucky bluegrass, redtop, orchard grass, and Korean lespedeza; on Ashe soils, bluegrass, orchard grass, and some clover; and on Clifton soils, Korean lespedeza, orchard grass, and redtop, or lespedeza alone. Usual rates of seeding on most lands are 25 pounds of the various mixtures an acre.

The grazing season extends from about April 1 to October 30, and pasture yields are generally good. Porters soils produce the best upland pasture, followed in order by the Ashe and Clifton. Well-drained bottom land soils and soils on low terraces are desirable for pasture, but most of these areas are used for tilled crops. The carrying capacity of pasture on the bottom land and the terrace soils is higher than that on the upland soils.

Some livestock is raised, and 1,312 farms reported livestock and livestock products sold or traded in 1944. Almost every well-established farm has a few hogs, one to three milk cows, and a small flock of chickens. The hogs are raised chiefly for a home supply of lard and meat, although a few are sold to local markets. Much of the milk and a large quantity of the chickens and eggs produced are used by the farm households; the rest are sold to outside markets. The number of livestock on farms in the census years 1920, 1930, 1940, and 1945 are given in table 14.

TABLE 14.—*Number of livestock on farms in Mitchell County, N. C., in stated years*

Livestock	1920	1930 [1]	1940 [2]	1945
Horses and colts	1,237	786	973	1,164
Mules and mule colts	797	635	275	228
Cattle and calves	4,697	4,869	4,814	6,394
Hogs and pigs	4,167	1,919	2,171	2,294
Sheep and lambs	1,556	1,645	897	498
Goats and kids	3	7	28	6
Chickens	39,039	32,509	37,567	46,962
Beehives	945	1,027	980	[3]

[1] Over 3 months old on Apr. 1, except goats and kids, which were of all ages.
[2] Over 3 months old on Apr. 1, except chickens, which were 4 months old.
[3] Data not available.

Specified livestock products produced or sold in 1939 and 1944 are given in table 15.

TABLE 15.—*Livestock products produced or sold in Mitchell County, N. C., in 1939 and 1944*

Products	1939	1944
	Quantity	*Quantity*
Milk produced—gallons	1, 128, 521	1, 500, 520
Whole milk sold—do	106, 457	387, 730
Cream sold—pounds	[1] 12, 641	[2]
Butter churned on farms—do	269, 866	[2]
Butter sold—do	15, 256	6, 327
Wool shorn—do	3, 435	2, 188
Honey produced—do	309	[2]
Chicken eggs produced—dozens	214, 034	192, 899
Chickens sold—number	9, 052	[2]

[1] Butterfat. [2] Not available.

TYPES AND SIZE OF FARMS

The 1945 census classified the farms by total value of farm products sold or traded in 1944. Accordingly, 1,187 farms were shown as having derived their major source of income from farm products used by the farm household; 392, from field crops; 48, from livestock; 48, from dairy products; 44, from forest products; 13, from fruits; and 10, from poultry and poultry products.

In 1945 owners and part owners operated 93.7 percent of the farms and tenants 6.3 percent. In 1945 there were 1,944 farms in the county, with an average size of 41.9 acres. Land in farms aggregated 81,613 acres, or 58 percent of the county area. A total of 22.057 acres was cropped in 1944, and 2,435 acres was in idle or fallow cropland, 7,805 in plowable pasture, 13,945 in other land pastured, 31,430 in woodland, and 3,941 in all other land in farms.

The number of farms, total land in farms, and cropland harvested, classified by size of farm, as reported by the 1945 census, are given in table 16.

About 73 percent of the farms range in size from less than 10 to 50 acres, about 22 percent have between 50 and 140 acres, and 5 percent have more than 140 acres. The larger part of the cropland harvested was on farms less than 140 acres in size.

FARM EXPENDITURES

About 56 percent of the farms reported hiring labor in 1944. Total labor costs were $74,487, or an average of $68.46 a farm reporting. About 76 percent of the farms in the county reported combined expenditures of $120,649 for feed, or an average of about $81 a farm reporting.

In 1939, 1,553 farms reported using a total of 1,094 tons of fertilizer at a cost of $28,691, or an average of $18.45 a farm. In addition, 79 farms used 762 tons of liming material at a total cost of $1,881.

TABLE 16.—*Number of farms, total land in farms, and cropland harvested, classified by size of farm, in Mitchell County, N. C., in 1944*

Farms		Land in farms	
Size (acres)	Number	Total	Cropland harvested
		Acres	*Acres*
Under 10	377	2, 157	1, 083
10–29	644	11, 446	4, 138
30–49	410	15, 199	4, 669
50–69	210	11, 906	3, 362
70–99	140	11, 231	3, 187
100–139	74	8, 358	1, 686
140–179	42	6, 620	1, 492
180–219	20	3, 849	809
220–259	4	938	162
260–379	10	3, 080	387
380–499	8	3, 429	340
500–699	3	1, 500	240
700–999	1	700	195
1,000 +	1	(1)	(1)

[1] Not reported.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of the forces of weathering and soil development acting on the parent material deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) the plant and animal life in and on the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of development have acted on the material. The climate and its influence on soil and plants depends not only on temperature, rainfall, and humidity but also on the physical characteristics of the soil or soil material and on the relief, which, in turn, strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind.

The parent material of the soils of Mitchell County may be considered in two broad classes—(1) material residual from the weathering of rocks in place and (2) material transported by water or gravity and laid down as unconsolidated deposits of clay, silt, sand, and rock fragments. Material of the first class is related directly to the underlying rocks from which it was derived; that of the second, to the soils or rocks from which it was transported.

The residual parent material, consisting of weathered products of igneous and metamorphic rocks, differs greatly in chemical and mineralogical composition, and the soil parent material derived from them differs correspondingly in composition and physical character. The rocks of this county have not been studied adequately to determine differences in chemical and mineralogical composition and to correlate

such differences with those among the soils developed from them. It is apparent, however, that differences among most soils developed from the residual products of rock weathered in place are associated with differences among the rocks from which they were derived. Similar rocks underlie dissimilar soils in several places where differences in relief have been important contributing factors.

Although some of the characteristics of soils can be correlated with the kinds of parent materials from which the soils were derived, other soil characteristics, especially those of regional significance to soil genesis, cannot be so correlated and must be attributed to other factors.

Owing to the great range in elevation, the climate varies from place to place, bringing about a corresponding difference in the soils. Valley sections are characterized by fairly long but only moderately warm summers, relatively short mild winters, and moderately high rainfall. The moderately warm weather favors rapid chemical reaction under the moist conditions existing in the soil much of the time. Since the soil is frozen for only short periods and to shallow depths, further intensification occurs in the degree of weathering and translocation of materials.

Temperatures are much lower in the mountainous section than in the valleys. Chemical reactions in soils on the mountains are appreciably slower under these conditions than in the valleys. The high rainfall, however, tends to leach soluble materials from the soil and to translocate less soluble materials and colloidal matter downward in the soil. As the soil is frozen for longer periods and to greater depths on the mountains than in the valleys, leaching is retarded correspondingly.

Within any one climatic zone certain outstanding characteristics are common to the well-drained, well-developed soils, but the soils differ in other characteristics that may be correlated with factors other than climate. The kinds of parent material have been outstandingly important in causing differences among soils. The climate in most of the county has characteristics of both the Red and Yellow Podzolic and the Gray-Brown Podzolic soil regions; consequently, these soils are intimately associated, and differences in such factors as parent material, drainage, and age have been important in determining the great soil group to which many of the soils belong. In general, the climatic conditions of the valleys are those that commonly give rise to soil of the Red or Yellow Podzolic great soil group, and those of the mountains, to Gray-Brown Podzolic soils. Gradations between these two conditions of soil formation may be found.

Higher plants, micro-organisms, earthworms, and other forms of life live on and in the soil and contribute to its morphology. The nature of the changes they bring about depends, among other things, on the kinds of life and the life processes peculiar to each. The kinds of plants and animals that exist are determined by the kind of climate, parent material, and relief; by the age of the soil; and by other organisms that constitute their environment. Climate is the most apparent but not always the most important determinant of the kinds of higher plants that grow on the well-developed, well-drained soils, and thus exerts a powerful indirect influence on their morphology. Climate and vegetation together, therefore, are the active factors of soil formation.

Forest, consisting principally of deciduous trees, originally covered this county. Chestnut, Northern red oak, sugar maple, hemlock, spruce, yellow birch, black cherry, magnolia (cucumbertree), and beech trees were dominant in the mountains; white ash, yellow-poplar, basswood (linden), white and other oaks, chestnut, white pine, hickory, and walnut trees in the valleys. The undergrowth of the mountain forest included many plants, as galax, huckleberry, rhododendron, and mountain-laurel, which were often absent in the valley forest. These differences have been partly the result of the dissimilarity of climate.

Many of the trees and shrubs are moderately deep feeders, and most of them shed their leaves annually. The content of the various plant nutrients in the leaves ranges considerably, but in general, the quantities of bases and phosphorus returned to the soil by the leaves of deciduous trees are high compared with those returned by coniferous trees. In this transfer of materials, essential plant nutrients returned to the upper part of the soil from the lower partly replace those lost through the action of percolating waters. This transfer of plant nutrients is probably greater in soils of the valleys than in those of the mountains and tends to offset to some extent the more rapid weathering of rocks and leaching of soils in the valleys.

Organic material is added to the soil by the decay of leaves, twigs, roots, and entire plants. Most of it is on the topmost part, where it is acted on by micro-organisms, earthworms, and other forms of life and by direct chemical reaction. The rate of decomposition is probably more rapid in the valleys than on the mountains, and partly as a result of this some well-drained soils of the higher mountains contain considerably more organic matter than do well-drained soils of the valleys. Decomposition of organic material releases organic acids, which promote the rate of solution of soluble constituents and the rate of leaching and translocation of inorganic materials. The intensity of the effect is conditioned by climate as it affects the kinds of vegetation, the kinds of micro-organisms, and rates of reaction and leaching.

Relief ranges from almost level to very steep and modifies the effects of climate and vegetation. On some steep areas where the quantity of runoff is large, geologic erosion is rapid and keeps almost even pace with rock weathering and soil formation. Soil material, constantly being removed or mixed by slides, does not remain in place long enough for a profile of genetically related horizons to form. The quantity of water that percolates through the soil is small, and the degree of leaching and translocation of material are correspondingly small. Vegetation is commonly less dense on such soils than on those with more favorable moisture relations. Soils with steep slope are better developed where the slope is concave than where it is convex, for moisture conditions favor a dense growth of vegetation, and geologic erosion is slow; in fact, on many concave slopes, soil material is accumulating.

In some nearly level areas where both internal and external drainage are slow, soils whose materials have been in place for a long time have characteristics that well-drained soils do not have. Their subsoil is commonly mottled yellow and gray and may be very compact. Geologic erosion is ordinarily slow, and a highly leached surface layer and a compact subsoil may develop. Micropopulation and

vegetation are also different from those on well-drained soils, and conditions are less favorable for the rapid decomposition of organic matter.

The soils range from very young to very old, but they are largely young to very young. The two broad groups comprising the young soils are those with materials that have been in place for only a short time and have not been influenced sufficiently by climate and vegetation to develop well-defined and genetically related profile horizons, as soils of the first bottoms, and those with steep slope that have their materials constantly renewed or removed by geologic erosion and do not develop genetically related horizons. Soils that have been in place for a long time and have approached equilibrium with their environment are considered mature or old. Some of the well-drained soils that are almost level and very little eroded have developed more intense profile characteristics than have the well-drained, well-developed soils on the gently rolling uplands. They are termed very old soils.

The highest category into which soil series may be grouped is called the soil order, which consists of three divisions—zonal, intrazonal, and azonal. Subdivisions within each order are called great soil groups. The soil series are classified according to order and great soil group and the parent rock of each is given as follows:

	Parent rock
Zonal soils:	
Red Podzolic:	
Clifton	Dark basic igneous or metamorphic rocks.
Hayesville	Light-colored granite, gneiss, or schist.
Fannin	Mica schist or mica gneiss.
Yellow Podzolic:	
Altavista	Alluvium.
Tate	Colluvium, some alluvium.
Gray-Brown Podzolic:	
Balfour	Light-colored granite, gneiss, and schist.
Edneyville	Granite and gneiss.
Tusquitee	Colluvium.
Watauga	Mica schist and mica gneiss.
State	Alluvium.
Lithosolic Gray-Brown Podzolic:	
Porters	Granite or gneiss, seldom schist.
Ashe	Granite or gneiss.
Intrazonal soils:	
Brown Forest:	
Burton	Do.
Planosol (modified):	
Worsham	Do.
Azonal soils:	
Lithosol:	
Chandler	Mica schist or mica gneiss.
Talladega	Do.
Ramsey	Highly siliceous rock.
Alluvial:	
Congaree	Recent alluvium.

Zonal soils are defined as any one of the great groups of soils having well-developed soil characteristics that reflect the influence of the active factors of soil genesis—climate and living organisms, chiefly vegetation (*2*). In this county, the zonal soils are members of the Red Podzolic, Yellow Podzolic, Gray-Brown Podzolic, and lithosolic Gray-Brown Podzolic great soil groups. These great soil groups and their series members are defined and described below.

Red Podzolic soils comprise a zonal group of soils having thin organic and organic-mineral layers over a yellowish-brown leached layer resting on an illuvial red horizon. These soils have developed under a deciduous or mixed forest in a warm-temperate moist climate. The soil-forming processes involved in their development are laterization and podzolization (*2*, *6*).

The most extensive of the Red Podzolic soils belong to the Clifton series, which developed from dark-colored basic igneous or metamorphic rocks on undulating to steep relief in the intermountain and, to some extent, mountain uplands. They are characterized by a light-brown to brown surface soil over a compact but moderately friable brown to reddish-brown clay subsoil and differ from the Hayesville in being not so red and from the Fannin in being a darker brown. Development took place under a warm moist climate and deciduous forest characteristic of regions marginal between Gray-Brown Podzolic and Red and Yellow Podzolic soil regions. The parent rock weathers to a darker residuum under such conditions and apparently contains less silica and more clay-forming minerals than do the rocks underlying the Balfour and Watauga soils. The base status of the residuum is higher than that of the parent material of the Hayesville, Fannin, or Watauga soils.

Hayesville and Fannin soils, as well as Clifton, have the common characteristics of the Red Podzolic great soil group. They apparently have developed under relatively similar conditions of climate and vegetation; are well drained; and although they range somewhat in degree of maturity, have at least a moderately well-developed Red Podzolic soil profile. Differences among these soils are not primarily due to slope differences, even though relief ranges from gently sloping to steep, but rather to outstanding differences in the kinds of parent material from which the soils are derived.

The Red Podzolic soils are mainly in the lower lying parts of the county, on the uplands of the intermountain valleys or lower mountain slopes, or on terraces along streams where temperature is highest. They are derived from materials generally higher in bases or that have been in place for a longer time than those of Gray-Brown Podzolic soils, which may occur at similar elevations. Internal drainage is slightly better than in the associated Yellow Podzolic soils.

The following profile description of a Clifton soil is in a forested area:

A. Thin layer of forest litter.
A_1. 0 to 2 inches, reddish-brown very friable clay loam with a small quantity of decomposed organic matter and many fine roots.
A_2. 2 to 8 inches, reddish-brown granular clay loam friable when nearly dry, but slightly sticky when wet; a few openings or holes are coated with organic matter; a large number of fine roots are present.
B. 8 to 35 inches, dark brownish-red moderately heavy clay with nutlike structure and somewhat crumbly consistence; sticky when wet; a few openings are coated with organic matter; a few small roots are in the upper part and some large roots throughout the horizon.
C_1. 35 to 50 inches, ocherous-yellow, yellowish-red, and reddish-yellow friable disintegrated and partly decomposed basic igneous rock.
C_2. 50 inches +, yellowish- or light grayish-brown soft but gritty decomposed hornblende gneiss rock; slightly hard in places, yet retaining the structural lines of the original rock.

Yellow Podzolic soils, which developed under a mixed or coniferous forest in a warm temperate moist climate, are a zonal group of soils

having thin organic and organic-mineral layers over a grayish-yellow leached layer resting on a yellow horizon (*6*).

Altavista sandy loam and Tate silt loam are the only Yellow Podzolic soils in the county. Altavista sandy loam is developed on low narrow terraces of alluvial material and is associated with State, Tusquitee, and Congaree soils. Tate silt loam is developed on colluvium transported mainly from soils underlain by igneous and metamorphic rocks. These soils are characterized by a yellowish-gray surface soil and generally a yellowish moderately compact subsoil. Internal drainage is restricted but adequate for most farm crops.

The Altavista soil has formed under parent material, climate, relief, and vegetation similar to those of the State soil but differs chiefly in being older. The Tate soil is derived from parent material that is lighter colored and in general more micaceous than that giving rise to the Tusquitee soils. In most areas it has a less mature profile, although both soils have developed under similar climate, relief, and vegetation. Slow internal drainage may be partly responsible for the more yellow color of the Tate as compared with the brown color of the Tusquitee profiles.

The following is a profile description taken in a cultivated area:

A$_a$.[8] 0 to 10 inches, yellowish-gray friable sandy loam with only a small quantity of organic matter; in unburned forested areas this layer to a depth of about 1 inch would be gray or dark-gray friable loam, containing an appreciable quantity of organic matter derived from decayed leaves and other plant remains.

B. 10 to 30 inches, yellow friable to moderately compact sandy clay to silty clay.

C. 30 inches +, mottled yellow and gray compact and very slightly plastic silty clay.

The surface layer varies somewhat in color, thickness, and texture from place to place. Locally a few small water-worn rocks may occur on the surface and in the profile.

Gray-Brown Podzolic soils are a zonal group of soils having a comparatively thin organic covering and organic-mineral layers over a grayish-brown leached layer that rests on an illuvial brown horizon. These soils are developed under deciduous forest in a temperate moist climate. Podzolization is the dominant soil-forming process (*2*, *6*). In Mitchell County these soils occupy high elevations where the climate is cooler than in most places at similar latitudes. In most places they are higher than the Red Podzolic soils, but may occur side by side with them. Usually where these soils are associated, the Red Podzolic soils are derived from material that is higher in bases or is older than the Gray-Brown Podzolic soils, but they have apparently developed under similar vegetation and on like relief. Soils of both groups are well drained.

The soils of the Balfour, Edneyville, Tusquitee, Watauga, and State series are included in the Gray-Brown Podzolic group. Members of the Tusquitee series, the most extensive of this group in the county, have formed on colluvial slopes from an accumulation of soil material and rock waste that washed, rolled, or sloughed from the uplands. Their relief ranges from very gently rolling to strongly sloping. The

[8] The symbol A$_a$ is used to designate the upper part of the A horizon mixed or otherwise altered by the activities of man.

Tusquitee soils vary considerably in age, and their character is changed somewhat from time to time by the addition of new material through colluvial action. Although the well-developed soils belong to the Gray-Brown Podzolic great soil group, as mapped they include young soils that should be considered members of the alluvial great soil group because they lack profile development and show little differentiation in the soil from the surface downward.

In general, the profile of a Tusquitee soil in a forested area shows the following characteristics:

A_0. Thin layer of forest litter.
A_1. 0 to 2 inches, dark grayish-brown friable loam with a moderate quantity of decomposed organic matter mixed with the mineral soil material.
A_2. 2 to 15 inches, brown friable loam, somewhat granular, but slightly sticky when wet; contains some decomposed organic matter apparently mixed with the mineral soil and many fine roots.
B. 15 to 34 inches, yellowish-brown to brown friable clay loam easily pervious to water and roots.
C_1. 34 inches +, yellowish-brown or brownish-yellow friable clay loam splotched with brown, yellow, and gray; generally contains some rounded stone in the upper part and a few flat angular rock fragments in the lower part.

Differences among the Gray-Brown Podzolic soils are due mainly to differences in parent material or relief.

Soils of the Porters and Ashe series are designed as lithosolic Gray-Brown Podzolic soils to indicate the relatively weak development of their textural profiles. Their respective well-developed profiles may be found in the Balfour and Edneyville soils, which occupy considerably less steep slopes but have formed under like climate and vegetation from similar parent material.

Soils of the Porters series, by far the most extensive of any in Mitchell County, have developed from dark-colored granite and gneiss on steep relief in a mountainous landscape. Most areas have a weakly formed Gray-Brown Podzolic profile that is not sufficiently developed in general to justify considering this series as entirely a member of that zonal group. This series is characterized by a friable dark-brown surface soil and a brown to yellowish-brown very permeable subsoil. It is generally less than 32 inches deep, and outcrops of bedrock are common in places. Lack of development is related to the relatively steep slopes and consequent insufficient stability to allow the mature soil profile to develop. Porters soils are darker colored and apparently higher in content of plant nutrients than Ashe soils, which have developed under a similar climate but from parent material that is higher in silica and lower in clay-forming minerals.

A profile of a Porters soil in a forested area is as follows:

A_0. Thin layer of forest litter.
A_1. 0 to 2 inches, dark-brown friable loam with an appreciable quantity of organic matter derived from the decay of leaves, twigs, and other plant remains.
A_2. 2 to 10 inches, brown friable loam with a small quantity of decomposed organic matter mixed with the mineral material and numerous roots.
B. 10 to 28 inches, brown, reddish-brown, or yellowish-brown friable permeable clay with many small openings usually coated with organic matter; many fine roots are throughout the upper half of this layer.
C. 28 inches+, mixed gray, yellow, and light brownish-yellow soft friable partly decomposed granite or gneiss rock intermixed with some soft and hard angular rock fragments.

There is no uniformity in this thickness of the profile layers, but color differences among the various layers are fairly easy to distinguish in most places. The soil is readily pervious to moisture, air, and roots, and its water-holding capacity is very good.

Intrazonal soils are any of the great groups of soils with well-developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of climate and vegetation (*6*). In this county they are members of the Brown Forest and Planosol great soil groups.

Brown Forest soils, which developed under deciduous forest in temperate humid regions from parent material moderately rich in bases, are an intrazonal group of soils relatively rich in humus (mull) that have a very dark-brown surface horizon and grade through lighter colored soil into the parent material. They are characterized by slight acidity, little or no illuviation of iron and alumina, and a moderate content of calcium in the soil colloids (*6*).

Burton stony loam is a Brown Forest soil, developed on the tops of mountains and in high mountain coves largely from hornblende gneiss and schist, which generally lie at a shallow depth. The soil is characterized by a very dark-gray or almost black thick highly organic surface layer over yellowish-brown friable clay loam. Bedrock outcrops are common. The original vegetation was probably deciduous trees, but some areas were covered by grasses, sedges, and shrubs when the county was first settled. The cool moist climate under which the soil has developed favors slow decomposition of organic matter, a factor that has contributed greatly to the accumulation of organic material. Trees and grasses that contribute organic material high in bases may also have been a factor in the formation of a thick upper layer, and it is reasonably certain that the parent material is relatively high in bases, although the soil is strongly acid.

Angular rock fragments, up to 10 inches in diameter, are strewn over the surface of the Burton soil and mixed with it. Some boulders are on the surface, and bedrock outcrops in many places. The profile in a forested or grassed area has the following characteristics:

0 to 18 inches, very dark-gray or almost black friable stony loam with a large quantity of decayed vegetable matter.
18 to 30 inches, deep-brown heavy loam or friable clay loam, stained darker by organic matter in the upper part.
30 inches +, brownish-yellow to dark-brown friable clay or sandy clay mixed with slightly weathered angular fragments of hornblende gneiss rock.

On the northern slopes and in sheltered coves the Burton soil profile resembles that of the Half Bog soils. These areas have mucklike surface material and a gray loam or friable clay loam subsoil.

Planosols are an intrazonal group of soils with eluviated surface horizons underlain by B horizons more strongly illuviated, cemented, or compacted than associated normal soils. They have developed on nearly flat upland surface under grass or forest vegetation in a humid or subhumid climate (*6*).

Worsham loam, locally known as crawfish land, is a modified Planosol developed on nearly level areas. It is a young upland soil formed from igneous and metamorphic rock and in places probably from colluvium. It is closely associated with Hayesville, Fannin, Watauga, and other valley soils and with the lower lying colluvial

soils, chiefly Tate. The surface is light-colored and friable; the subsurface, pale-yellow or light brownish-yellow friable clay loam; and the subsoil, mottled gray and yellow heavy slightly plastic and sticky clay. External drainage is poor to fair, but internal drainage is very poor. Although its characteristics are associated with such unfavorable drainage, it is uncertain whether the slow internal drainage caused the development of the heavy B horizon or results from its development. Relief is generally of such character that normal erosion is slow, which may have contributed to the formation of the somewhat dense B horizon. It is possible that relatively dense layers in the original material may have impeded internal drainage, which combined with slow external drainage, has caused the comparatively abnormal concentration and compaction in the B horizon.

The following description is of a profile of Worsham loam in a pastured area:

A₁. 0 to 8 inches, yellowish-gray friable to very slightly compact loam containing little organic matter; in forested areas, light-gray or gray loam to a depth of about 1 inch, then underlain by a pale-yellow friable loam.

B. 8 to 22 inches, yellow or brownish-yellow fairly friable clay loam, becoming heavier in structure and consistence and mottled with gray and yellow with depth; slightly sticky when wet and hard and tough when dry.

C. 22 inches +, steel-gray heavy clay mottled with yellow and rust brown; in places is a thin layer of white quartz gravel between the subsoil layer and the gray clay substratum.

Azonal soils are any group of soils that have been prevented by their youth or the condition of their parent material or relief from developing normal soil profile characteristics (*6*). In this county they are members of the Lithosol and Alluvial great soil groups.

Lithosols are an azonal group of soils having no clearly expressed soil morphology and consisting of a freshly and imperfectly weathered mass of rock fragments, largely confined to steeply sloping land (*6*). In this county the Lithosols are soils that are very shallow over bedrock and that have little development of a genetic profile. They are generally steep and broken or severely eroded. Geologic erosion almost keeps pace with the weathering of rocks. Materials slough, slip, or roll down the slopes so frequently that little true soil can develop. Some areas of zonal soils are included in the mapping units.

The soils of the Chandler, Talladega, and Ramsey series are included in the Lithosol group. Soils of the Chandler series, the most extensive of the Lithosols in the county, have developed from highly micaceous rocks—chiefly mica and chlorite schist—on steep mountainous areas. They are characterized by a light brownish-gray loam surface soil and a yellow to yellowish-brown silty clay loam subsoil. Quantities of mica, present throughout the profile, give the soil a slick or greasy feel. These soils are generally less than 25 inches deep, and outcrops of bedrock are common in places.

Chandler soils are associated with those of the Talladega, Fannin, and Watauga series. They occupy the same general relief and landscape as the Talladega but are slightly more friable. They differ from the Watauga in being more shallow and having much steeper relief, but they are similar in color. Unlike the Talladega and Fannin soils, which are red, the Chandler soils are yellowish. They are

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shallower and occupy much steeper relief than the Fannin soils. The lack of depth in the Chandler and Talladega soils is related to steepness of slope and consequent insufficient stability for development of a mature soil profile. Soils of the Ramsey series are formed on relief and landscape similar to Chandler soil and resemble them in color, although they are from highly siliceous rock containing little mica.

A profile description of a Chandler soil in a forested area has these characteristics:

Very thin layer of forest litter.
0 to 4 inches, light brownish-gray friable loam with a small quantity of organic matter; a slight organic stain is noticeable throughout layer; plant roots are numerous.
4 to 7 inches, pale-yellow or brownish-yellow friable loam with numerous plant roots and a slick or greasy feel owing to finely divided mica.
7 to 25 inches, yellow, brownish-yellow, or faintly pinkish-yellow friable silty clay loam with fine and large flakes of mica, a number of plant roots, and a few openings stained with organic matter.
25 inches +, yellow, gray, and brown soft disintegrated mica schist rock that is very smooth and greasy; some flat angular rock intermixed with the material.

Alluvial soils are an azonal group of soils developed from transported and relatively recently deposited material (alluvium) and characterized by little or no modification of the original material by soil-forming processes (*6*). The Congaree series and the Alluvial soils, undifferentiated, which includes members of the Chewacla, Toxaway, and Wehadkee series as well as some Congaree material, belong to the Alluvial great soil group. The Congaree is well drained, the Toxaway and Wehadkee poorly drained, and the Chewacla is intermediate in drainage. In places the Toxaway has developed to a minor degree some of the characteristics of the Half Bog soils.

The Congaree is a young soil of first bottoms derived from alluvial materials washed mainly from soils underlain by crystalline rocks. It is subject to overflow, and, since new materials are deposited periodically, the soil remains very young. It has developed little or no genetically related horizons, and varies from place to place in the kind and arrangement of its soil layers. Colors range from light to dark brown in the topmost layers, and from brown to brownish yellow mottled with brown at a depth of about 2 feet in the lower layers. The texture ranges from loamy fine sand to silt loam but is chiefly fine sandy loam.

A profile of Congaree fine sandy loam is as follows:

0 to 14 inches, grayish-brown to brown very friable fine sandy loam, containing a small quantity of decomposed organic matter.
14 to 32 inches, yellowish-brown or brown friable fine sandy loam or fine sandy clay loam, which is slightly sticky when wet.
32 inches +, mottled gray, brown, and yellow friable loamy fine sand or fine sandy loam.

Considerable variation is in the profile. The surface soil ranges from 8 to 20 inches thick, and the second layer, from 18 to 36. The first layer consists of very fine sandy loam, silt loam, or sandy loam, and the second layer is loamy fine sand or loamy sand. Finely divided mica flakes occur throughout the profile in most areas.

The miscellaneous land types—Rough gullied land (Clifton and Talladega soil materials), Rough stony land (Porters soil material),

Rolling stony land (Clifton soil material), Stony colluvium (Porters soil material), and Rock outcrop—are azonal soils. Rough gullied land is a Lithosol and represents soils truncated by accelerated erosion. Most areas have lost all of their surface soil and a large part of the subsoil and are now cut by an intricate pattern of gullies. Rough stony land is a very shallow Lithosol having sufficient rock outcrops to make the areas unsuitable for crops requiring tillage or for pasture. Nearly all areas have steep to precipitous slopes.

The soils are classified on the basis of differences in the parent rock. Rolling stony land is a shallow Lithosol having so many rock outcrops and so much stone on the surface and throughout the scanty soil material as to make the areas unsuitable for tilled crops. Relief ranges from rolling to hilly, and differences in parent rock are made the only basis for separation.

Most of the rock in rough stony land is acidic granite or gneiss, while much of that in rolling stony land is basic igneous rock. Rock outcrop consists almost wholly of bedrock. There is some soil material in interstices and crevices, but not a sufficient quantity to support more than a scattered cover of shrubs or an occasional scrubby tree. Stony colluvium is material washed from the steep slopes and deposited on the more level areas, enough soil generally being present to support some grass or tree growth.

GLOSSARY

Acidity. The degree of acidity of the soil mass technically expressed in pH values or in words as follows (*1*):

	pH		*pH*
Extremely acid_below	4.5	Neutral	6.6–7.3
Very strongly acid	4.5–5.0	Mildly alkaline	7.4–8.0
Strongly acid	5.1–5.5	Strongly alkaline	8.1–9.0
Medium acid	5.6–6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1–6.5		

Bedrock. The solid rock underlying soils

Colluvium. Deposits of rock fragments and soil material accumulated at the base of slopes through the influence of gravity, including creep and local wash of mixed character in places. Colluvial soils are developed from such material.

Consistence. Soil term expressing degree of cohesion and the resistance opposed to forces tending to deform or rupture the aggregates; the relative mutual attraction of the particles in the whole mass, or their resistance to separation.

Brittle. When dry, the soil breaks with a sharp, clean fracture; if struck a sharp blow, it will shatter into cleanly broken hard fragments.

Claypan. Layer or horizon of accumulation, or a stratum of stiff, compact, and relatively impervious clay.

Compact. Dense and firm but without any cementation.

Firm. Resistant to forces tending to produce rupture or deformation.

Friable. Readily ruptured and crushed with application of moderate force.

Impervious. Very resistant to penetration by water and usually by air and plant roots; impenetrable.

Plastic. Readily deformed without rupture; pliable but cohesive; can be easily molded; puttylike.

Sticky. Adhesive rather than cohesive when wet, but usually very cohesive when dry. When wet, soil shows a decided tendency to adhere to other materials and objects.

Stiff. Resistant to deformation or rupture; firm and tenacious and tending toward imperviousness. Usually applied to condition of the soil in place and moderately wet.

Tight. Compact, impervious, tenacious, and usually plastic.

Erosion, soil. The wearing away or removal of soil material by water or wind.

Fertility, soil. The inherent quality of a soil, as measured by its content of compounds necessary for proper or balanced growth of plants.

First bottom. The normal flood plain of a stream; land along a stream subject to overflow.

Horizon, soil. Layer or part of the soil profile approximately parallel to the land surface with well-defined characteristics.

Horizon A. The upper horizon of the soil mass from which material has been removed by percolating waters; the eluviated part of the solum; the surface soil. It is generally subdivided in two or more subhorizons, of which A_0 is not a part of the mineral soil but the accumulation of organic debris on the surface. Other subhorizons are designated as A_1, A_2, and so on.

Horizon B. The horizon of deposition, to which materials have been added by percolating waters; the illuviated part of the solum; the subsoil. This horizon may also be divided into several subhorizons, depending on the color, structure, consistence, or character of the material deposited. These layers are designated as B_1, B_2, B_3, and so on.

Horizon C. The horizon of partly weathered material underlying the B horizon; the substratum; usually the parent material.

Permeable. Easily penetrated, as by water.

Phase, soil. A subdivision of the soil type covering variations that are chiefly in such external characteristics as relief, stoniness, accelerated erosion, or depth of surface soil. (Example: Porters loam, eroded steep phase.)

Productivity, soil. The capability of a soil to produce a specified plant or plants under a given system of management.

Profile, soil. Vertical section of the soil from the surface into the underlying unweathered material.

Reaction, soil. *See* Acidity.

Series, soil. Group of soils having the same profile characteristics, as the same general range in color, structure, consistence, and sequence of horizons; the same general conditions of relief and drainage; and usually a common or similar origin and mode of formation. A group of soil types closely similar in all respects except the texture of the surface soil.

Slope classes:	*Percent*		*Percent*
Level	0–2	Hilly	15–30
Undulating	2–7	Steep	30–60
Sloping (rolling)	7–15	Very steep	more than 60

Soil (*See also* Consistence, Erosion, Fertility, Horizon, Phase, Productivity, Profile, Reaction, Series, Slope classes, Structure, Subsoil, Substratum, Surface soil, Texture, and Type). A natural body on the surface of the earth, composed of mineral and organic materials, in which plants grow.

Structure, soil. The arrangement of the individual grains and aggregates that make up the soil mass, referring to the natural arrangement of the soil when in place and undisturbed or to the soil at any degree of disturbance.

Subsoil. Technically, the B horizon; roughly, that part of the profile below plow depth.

Substratum. Material underlying the subsoil.

Surface soil. Technically, the A horizon; commonly, that part of the upper profile usually stirred by plowing.

Terrace (geologic). An old alluvial plain, usually flat or smooth, bordering a stream; frequently called second bottoms as contrasted with flood plains; seldom subject to overflow.

Texture. Size of the individual particles making up the soil mass. The various soil separates are the size groups, as sand, silt, and clay. A coarse-textured soil is one with a high sand content; a fine-textured soil has a large proportion of clay.

Type, soil. Group of soils having genetic horizons similar as to differentiating characteristics, including texture and arrangement in the soil profile, and developed from a particular type of parent material.

Upland (geologic). Lands consisting of materials unworked by water in recent geologic time and lying in general at higher elevation than the alluvial plains.

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MITCHELL COUNTY, NORTH CAROLINA, SOILS: SUMMARY OF IMPORTANT CHARACTERISTICS

Soil	Map symbol	Parent material	Slope	Internal drainage[1]	Surface soil			Subsoil	
					Color	Consistence	Thickness	Color	Consistence
			Percent				*Inches*		
Alluvial soils, undifferentiated	A	Alluvium	0–7	Slow to rapid	Light brown to black	Friable	6–15	Brown to dark gray	Variable.
Altavista sandy loam	As	Alluvium	2–7	Medium	Gray to grayish yellow	Friable	7–10	Yellow	Moderately compact.
Ashe loam:									
Eroded steep phase	Amt	Granite and gneiss	30–60	Medium	Grayish brown	Friable	[2] 4–7	Brownish yellow	Friable.
Eroded very steep phase	Ame	Granite and gneiss	60+	Medium	Grayish brown	Friable	[2] 3–5	Brownish yellow	Friable.
Steep phase	Ams	Granite and gneiss	30–60	Medium	Light brown to gray	Friable	5–8	Brownish yellow	Friable.
Very steep phase	Amv	Granite and gneiss	60+	Medium	Grayish brown	Friable	4–7	Brownish yellow	Friable.
Ashe sandy loam, hilly phase	Ahh	Granite and gneiss	15–30	Medium to rapid	Gray to grayish brown	Friable	3–7	Yellow to brownish yellow	Friable.
Ashe stony loam	Al	Granite and gneiss	30–60	Medium to rapid	Light grayish brown	Friable	3–9	Brownish yellow	Friable.
Balfour loam:									
Eroded hilly phase	Bld	Granite and gneiss	15–30	Medium	Yellowish brown	Friable	[2] 4–7	Yellowish brown to light reddish brown	Moderately friable.
Hilly phase	Blh	Granite and gneiss	15–30	Medium	Gray to grayish brown	Friable	6–8	Yellowish brown to light reddish brown.	Moderately friable.
Rolling phase	Blo	Granite and gneiss	7–15	Medium	Gray to grayish brown	Friable	6–10	Yellowish brown to light reddish brown.	Moderately friable.
Burton stony loam	Bu	Granite and gneiss	15–30	Medium to slow	Very dark gray to almost black.	Friable	8–20	Yellowish brown	Moderately friable.
Chandler loam:									
Eroded steep phase	Cht	Highly micaceous schist	30–60	Medium	Grayish yellow	Friable	[2] 2–6	Yellow to brownish yellow	Moderately friable.
Severely eroded steep phase	Chp	Highly micaceous schist	30–60	Medium	Brownish yellow	Friable	[2] 2–6	Yellow to brownish yellow	Moderately friable.
Steep phase	Chs	Highly micaceous schist	30–60	Medium	Gray to brownish gray	Friable	3–8	Yellow to brownish yellow	Moderately friable.
Clifton clay loam:									
Eroded hilly phase	Ccd	Basic igneous and metamorphic rocks	15–30	Medium to slow	Reddish brown	Moderately friable	[2] 4–6	Dark brown to reddish brown	Moderately compact.
Eroded rolling phase	Ccl	Basic igneous and metamorphic rocks	7–15	Medium to slow	Brown to reddish brown	Moderately friable	[2] 4–6	Dark brown to reddish brown	Moderately compact.
Eroded steep phase	Cct	Basic igneous and metamorphic rocks	30–60	Medium to slow	Reddish brown	Moderately friable	[2] 3–6	Dark brown to reddish brown	Moderately compact.
Hilly phase	Cch	Basic igneous and metamorphic rocks	15–30	Medium to slow	Brown to reddish brown	Friable	6–9	Dark brown to reddish brown	Moderately compact.
Rolling phase	Cco	Basic igneous and metamorphic rocks	7–15	Medium to slow	Brown	Friable	6–10	Dark brown to reddish brown	Moderately compact.
Severely eroded hilly phase	Ccr	Basic igneous and metamorphic rocks	15–30	Slow	Reddish brown	Moderately friable	[2] 4–6	Dark brown to reddish brown	Moderately compact.
Severely eroded steep phase	Ccp	Basic igneous and metamorphic rocks	30–60	Slow	Reddish brown	Moderately friable	[2] 2–5	Dark brown to reddish brown	Moderately compact.
Steep phase	Ccs	Basic igneous and metamorphic rocks	30–60	Medium to slow	Brown to reddish brown	Friable	4–6	Dark brown to reddish brown	Moderately compact.
Clifton stony clay loam:									
Hilly phase	Csh	Basic igneous and metamorphic rocks	15–30	Medium to slow	Brown	Friable	5–9	Dark brown to reddish brown	Moderately compact.
Severely eroded steep phase	Csp	Basic igneous and metamorphic rocks	30–60	Medium to rapid	Reddish brown	Moderately friable	[2] 3–6	Dark brown to reddish brown	Moderately compact.
Steep phase	Css	Basic igneous and metamorphic rocks	30–60	Medium	Brown	Friable	5–7	Dark brown to reddish brown	Moderately compact.
Congaree fine sandy loam	Cf	Alluvium	0–2	Medium to very rapid	Light brown	Very friable	8–12	Light brown to yellowish brown	Friable.
Edneyville loam	El	Granite and gneiss	5–20	Medium to rapid	Grayish brown	Friable	6–12	Brownish yellow	Moderately friable.
Fannin loam:									
Eroded hilly phase	Fld	Mica schist	15–30	Medium	Light reddish brown or red	Friable	[2] 3–6	Yellowish red to red	Moderately friable.
Hilly phase	Flh	Mica schist	15–30	Medium	Light brown	Friable	5–7	Yellowish red to red	Moderately friable.
Rolling phase	Flo	Mica schist	7–15	Medium	Light brown	Friable	5–8	Yellowish red to red	Moderately friable.
Hayesville clay loam:									
Eroded hilly phase	Hcd	Granite, gneiss, and schist	15–30	Medium	Reddish brown	Moderately friable	[2] 3–6	Brownish red to red	Moderately compact.
Eroded rolling phase	Hcl	Granite, gneiss, and schist	7–15	Medium	Reddish brown	Moderately friable	[2] 4–7	Brownish red to red	Moderately compact.
Severely eroded hilly phase	Hcr	Granite, gneiss, and schist	15–30	Medium	Reddish brown	Moderately compact	[2] 2–5	Brownish red to red	Moderately compact.
Hayesville loam:									
Hilly phase	Hlh	Granite, gneiss, and schist	15–30	Medium	Gray to yellowish gray	Friable	5–8	Brownish red to red	Moderately compact.
Steep phase	Hls	Granite, gneiss, and schist	30–60	Medium	Gray to yellowish gray	Friable	5–7	Brownish red to red	Moderately compact.
Porters-Clifton loams:									
Eroded steep phases	PCt	Mixed dark igneous rocks, gneiss, and schist.	30–60	Medium to slow	Light brown	Friable	[2] 4–6	Brown to slightly reddish brown	Friable.
Steep phases	PCs	Mixed dark igneous rocks, gneiss, and schist.	30–60	Medium	Brown to dark brown	Friable	5–9	Brown to slightly reddish brown	Friable.
Porters loam:									
Eroded steep phase	Plt	Granite and gneiss	30–60	Rapid	Light brown	Friable	[3] 3–6	Brown to slightly reddish brown	Friable.
Eroded very steep phase	Ple	Granite and gneiss	60+	Medium	Light brown	Friable	[2] 2–5	Brown to slightly reddish brown	Friable.
Severely eroded steep phase	Plp	Granite and gneiss	30–60	Very rapid	Light brown to reddish brown	Friable	[2] 2–5	Brown to slightly reddish brown	Friable.
Steep phase	Pls	Granite and gneiss	30–60	Rapid	Dark brown	Very friable	5–12	Brown to slightly reddish brown	Friable.
Very steep phase	Plv	Granite and gneiss	60+	Rapid	Dark brown	Very friable	4–7	Brown to slightly reddish brown	Friable.
Porters stony loam:									
Eroded steep phase	Ptt	Granite and gneiss	30–60	Medium to rapid	Light brown	Friable	[2] 4–7	Brown to slightly reddish brown	Friable.
Hilly phase	Pth	Granite and gneiss	15–30	Medium	Brown	Friable	6–12	Brown to slightly reddish brown	Friable.
Steep phase	Pts	Granite and gneiss	30–60	Medium to rapid	Brown to dark brown	Friable	5–9	Brown to slightly reddish brown	Friable.
Very steep phase	Ptv	Granite and gneiss	60+	Rapid	Brown to dark brown	Friable	4–7	Brown to slightly reddish brown	Friable.
Ramsey stony loam:									
Steep phase	Rts	Highly siliceous rocks	30–60	Medium to rapid	Yellowish gray	Friable	3–10	Light yellow to yellow	Friable.
Very steep phase	Rtv	Highly siliceous rocks	60+	Medium to rapid	Yellowish gray	Friable	3–5	Light yellow to yellow	Friable.
Rock outcrop	R	Mostly granite and gneiss							
Rolling stony land (Clifton soil material).	RsC	Mostly dark basic igneous rocks	7–30	Medium to slow					
Rough gullied land (Clifton and Talladega soil materials).	RgC	Mixed dark basic igneous and metamorphic rocks and mica schist.	15–30	Slow					
Rough stony land (Porters soil material).	RsP	Granite and gneiss	30–60+	Medium to rapid					
State silt loam	Ss	Alluvium	3–7	Medium	Grayish brown to brown	Friable	6–12	Yellowish brown to reddish brown	Friable.
Stony colluvium (Porters soil material).	ScP	Colluvium and alluvium	0–7	Medium to rapid	Grayish brown to dark brown.	Friable	5–12	Brown	Friable.
Talladega clay loam:									
Severely eroded hilly phase	Tcr	Highly micaceous schist	15–30	Medium to slow	Light red	Friable	[2] 2–5	Yellowish red to light red	Moderately friable.
Severely eroded steep phase	Tcp	Highly micaceous schist	30–60	Medium	Brownish red	Friable	[2] 2–5	Yellowish red to light red	Moderately friable.
Talladega loam:									
Hilly phase	Tlh	Highly micaceous schist	15–30	Medium	Brown	Friable	5–7	Yellowish red to light red	Moderately friable.
Steep phase	Tls	Highly micaceous schist	30–60	Medium to rapid	Brown	Friable	4–6	Yellowish red to light red	Moderately friable.
Tate silt loam	Ta	Colluvium	3–25	Medium to slow	Grayish brown to brown	Friable	8–20	Yellow to light yellowish red	Friable.
Tusquitee loam:									
Hilly phase	Tth	Colluvium	15–30	Rapid	Brown to dark brown	Very friable	9–15	Yellowish brown to slightly reddish brown.	Friable.
Rolling phase	Tto	Colluvium	7–15	Rapid	Brown to dark brown	Very friable	12–20	Yellowish brown to slightly reddish brown.	Friable.
Undulating phase	Ttu	Colluvium	2–7	Medium	Brown to dark brown	Very friable	12–24	Yellowish brown to slightly reddish brown.	Friable.
Tusquitee stony loam:									
Hilly phase	Tsh	Colluvium	15–30	Medium	Brown to dark brown	Very friable	6–10	Yellowish brown to slightly reddish brown.	Friable.
Rolling phase	Tso	Colluvium	7–15	Medium	Brown to dark brown	Very friable	6–12	Yellowish brown to slightly reddish brown.	Friable.
Watauga loan:									
Eroded hilly phase	Wld	Mica schist	15–30	Medium	Light yellowish brown	Friable	[2] 4–6	Yellowish brown to light reddish brown	Friable.
Hilly phase	Wlh	Mica schist	15–30	Medium	Grayish yellow	Friable	6–8	Yellowish brown to light reddish brown	Friable.
Rolling phase	Wlo	Mica schist	7–15	Medium	Brownish gray	Friable	6–9	Yellowish brown to light reddish brown	Friable.
Severely eroded hilly phase	Wlr	Mica schist	15–30	Medium	Yellowish brown	Friable	[2] 2–5	Yellowish brown to light reddish brown	Friable.
Worsham loam	Wo	Granite, gneiss, and schist	2–7	Slow	Gray to dark gray	Friable	6–9	Mottled yellow, brown, and gray	Moderately compact.

[1] Medium internal drainage refers to the optimum internal drainage conditions for most crops commonly grown in the county.

[2] Plow layer; where this layer is not indicated the thickness is of the A_1 and A_2 layers combined.

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DIVISION OF SOIL SURVEY, CHARLES E. KELLOGG, CHIEF
MAP DRAFTING, J. W. McKERICHER, IN CHARGE

SOIL MAP

MITCHELL COUNTY—SHEET NO. 1

NORTH CAROLINA

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
I. O. SCHAUB, DIRECTOR
TENNESSEE VALLEY AUTHORITY
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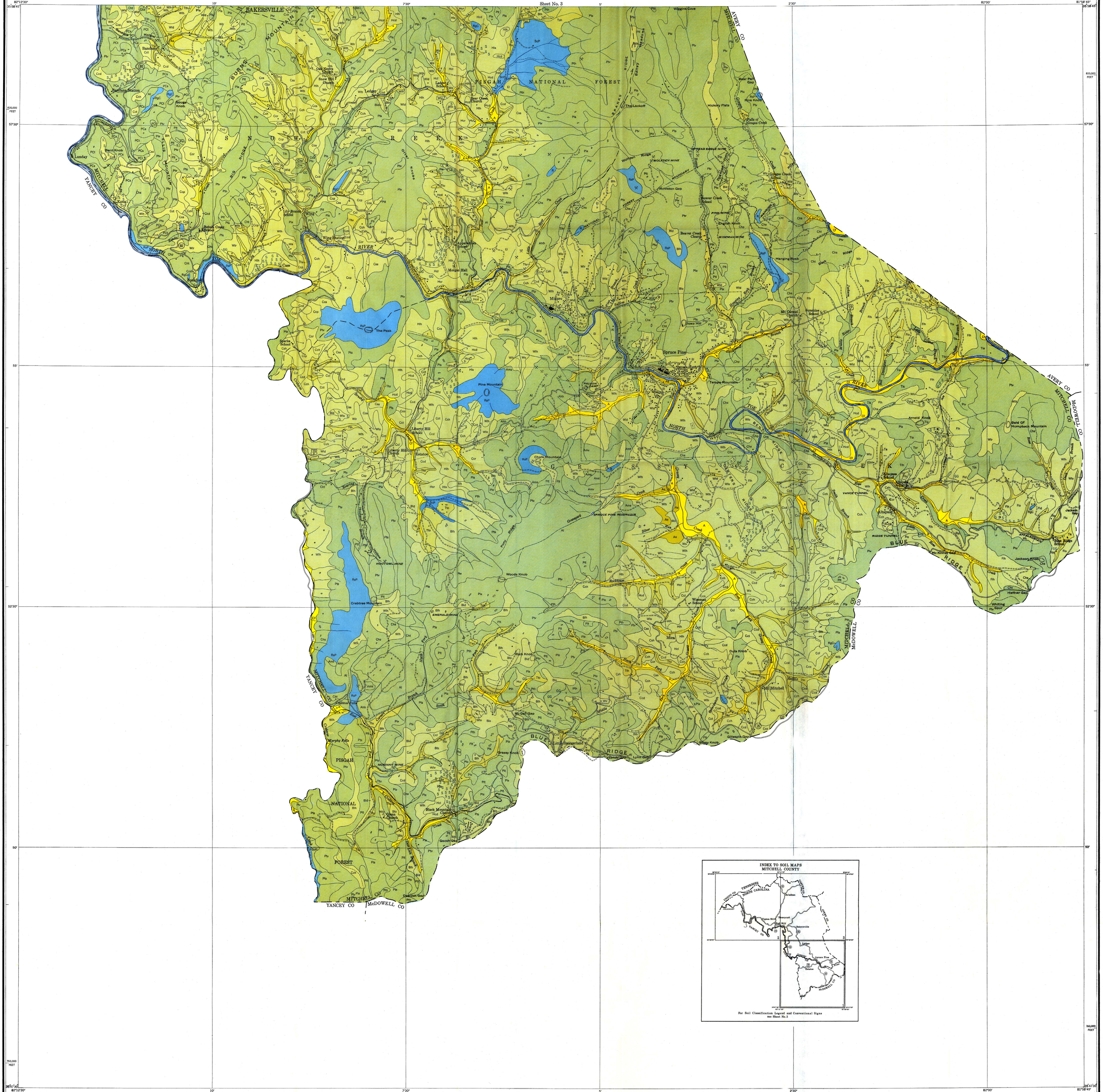
Sheet No. 3



INDEX TO SOIL MAPS
MITCHELL COUNTY

For Soil Classification Legend and Conventional Signs
see Sheet No.3

Area inspected by J. W. Moon, Principal Soil Scientist.
Soils surveyed by S. O. Perkins, U. S. Department of Agriculture, in charge, and William Gettys, North Carolina Agricultural Experiment Station.
Cartography by Tennessee Valley Authority, Maps and Surveys Division.

Scale 1:24,000

1 0 1 2 Miles

5,000 0 5,000 10,000 Feet

Polyconic projection, 1927 North American datum.
Base map compiled by Tennessee Valley Authority from TVA-USGS planimetric and topographic quadrangles.
10,000 foot grid based upon North Carolina system of plane coordinates.
Surveyed 1938-39. Series 1939.

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SOIL MAP

MITCHELL COUNTY—SHEET NO. 2

NORTH CAROLINA

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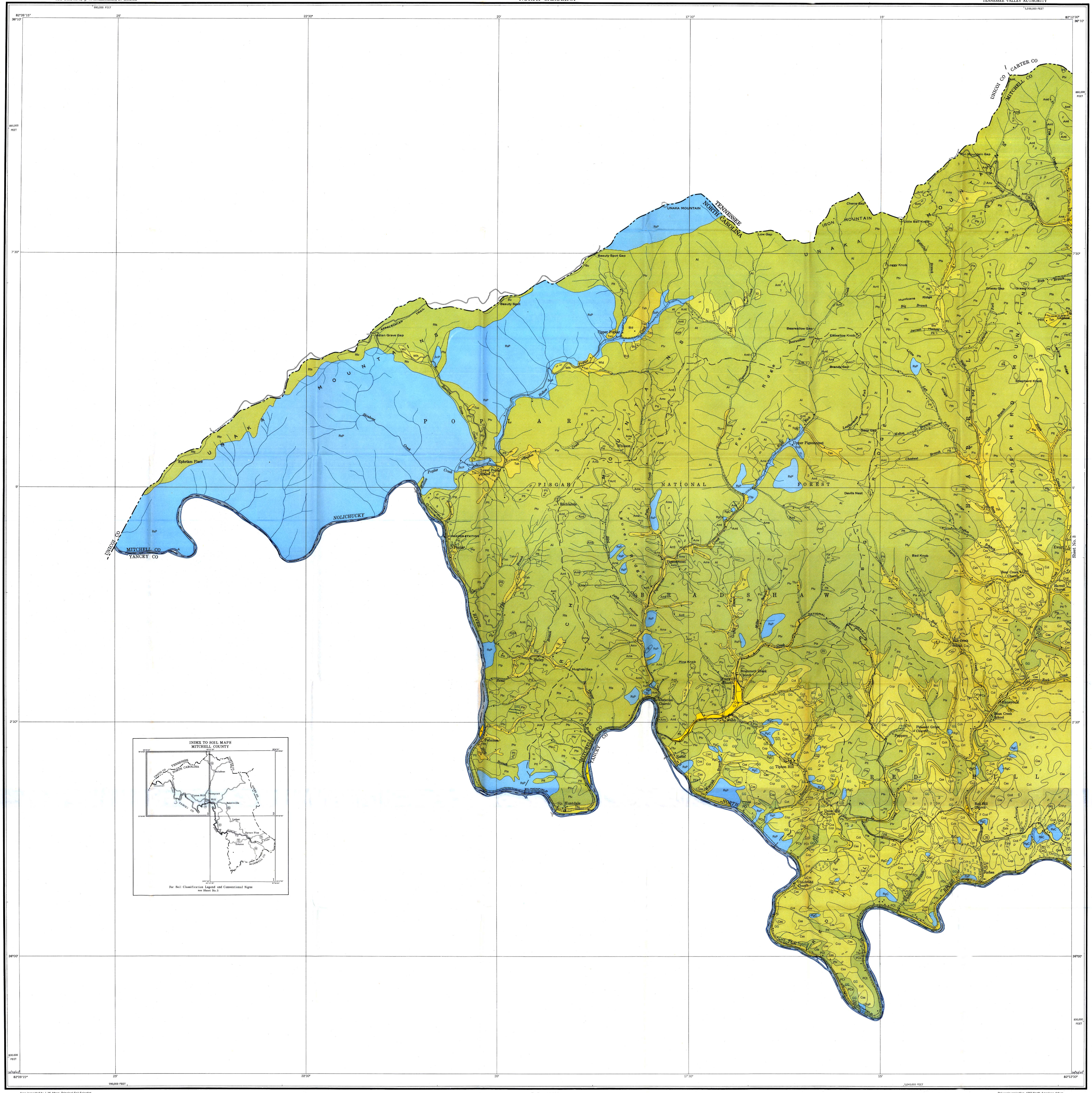

Area inspected by J. W. Moon, Principal Soil Scientist.
Soils surveyed by S. O. Perkins, U. S. Department of Agriculture, in charge, and William Gettys, North Carolina Agricultural Experiment Station.
Cartography by Tennessee Valley Authority, Maps and Surveys Division.

Scale 1:24,000

1 0 1 2 Miles

5,000 0 5,000 10,000 Feet

Polyconic projection, 1927 North American datum.
Base map compiled by Tennessee Valley Authority from TVA-USGS planimetric and topographic quadrangles.
10,000 foot grid based upon North Carolina system of plane coordinates.
Surveyed 1938-39. Series 1939.

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
ROBERT M. SALTER, CHIEF
DIVISION OF SOIL SURVEY, CHARLES E. KELLOGG, CHIEF
MAP DRAFTING, J. W. McKERICHER, IN CHARGE

SOIL MAP

MITCHELL COUNTY—SHEET NO. 3

NORTH CAROLINA

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
L. D. BAVER, DIRECTOR
TENNESSEE VALLEY AUTHORITY

INDEX TO SOIL MAPS
MITCHELL COUNTY

LEGEND

A	Alluvial soils, undifferentiated	Pfe	Porters loam, eroded very steep phase
As	Altavista sandy loam	Pfs	Porters stony loam, steep phase
Ams	Ashe loam, steep phase	Pft	Porters stony loam, eroded steep phase
Amt	Ashe loam, eroded steep phase	Pfh	Porters stony loam, hilly phase
Amv	Ashe loam, very steep phase	Pfv	Porters stony loam, very steep phase
Ame	Ashe loam, eroded very steep phase	PCs	Porters-Clifton loams, steep phases
Ahh	Ashe sandy loam, hilly phase	PCt	Porters-Clifton loams, eroded steep phases
Al	Ashe stony loam	Rfs	Ramsey stony loam, steep phase
Blo	Balfour loam, rolling phase	Rfv	Ramsey stony loam, very steep phase
Blh	Balfour loam, hilly phase	R	Rock outcrop
Bld	Balfour loam, eroded hilly phase	RsC	Rolling stony land (Clifton soil material)
Bu	Burton stony loam	RgC	Rough gullied land (Clifton and Talladega soil materials)
Chs	Chandler loam, steep phase	RsP	Rough stony land (Porters soil material)
Cht	Chandler loam, eroded steep phase	Ss	State silt loam
Chp	Chandler loam, severely eroded steep phase	ScP	Stony colluvium (Porters soil material)
Coh	Clifton clay loam, hilly phase	Tls	Talladega loam, steep phase
Ccd	Clifton clay loam, eroded hilly phase	Tcp	Talladega clay loam, severely eroded steep phase
Ccr	Clifton clay loam, severely eroded hilly phase	Tlh	Talladega loam, hilly phase
Cco	Clifton clay loam, rolling phase	Tcr	Talladega clay loam, severely eroded hilly phase
Ccl	Clifton clay loam, eroded rolling phase	Ta	Tate silt loam
Ccs	Clifton clay loam, steep phase	Tlo	Tusquitee loam, rolling phase
Cct	Clifton clay loam, eroded steep phase	Thu	Tusquitee loam, undulating phase
Ccp	Clifton clay loam, severely eroded steep phase	Tth	Tusquitee loam, hilly phase
Css	Clifton stony clay loam, steep phase	Tso	Tusquitee stony loam, rolling phase
Csh	Clifton stony clay loam, hilly phase	Tsh	Tusquitee stony loam, hilly phase
Csp	Clifton stony clay loam, severely eroded steep phase	Wlo	Watauga loam, rolling phase
Cf	Congaree fine sandy loam	Wlh	Watauga loam, hilly phase
El	Edneyville loam	Wld	Watauga loam, eroded hilly phase
Flo	Fannin loam, rolling phase	Wlr	Watauga loam, severely eroded hilly phase
Flh	Fannin loam, hilly phase	Wo	Worsham loam
Fld	Fannin loam, eroded hilly phase		
Hth	Hayesville loam, hilly phase		
Hcd	Hayesville clay loam, eroded hilly phase		
Hcr	Hayesville clay loam, severely eroded hilly phase		
Hls	Hayesville loam, steep phase		
Hcl	Hayesville clay loam, eroded rolling phase		
Pls	Porters loam, steep phase		
Plt	Porters loam, eroded steep phase		
Plp	Porters loam, severely eroded steep phase		
Plv	Porters loam, very steep phase		

SOIL GROUPS

- FIRST BOTTOM
- LOW TERRACE
- COLLUVIAL SLOPE
- INTERMOUNTAIN UPLAND
- MOUNTAIN UPLAND
- MISCELLANEOUS LAND TYPES

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

- City or Village, Roads, Buildings
- Secondary roads and Trails
- Railroad: DOUBLE TRACK, SINGLE TRACK, NARROW GAUGE
- Bridges, Ferry
- R. R. Crossings, Tunnel: R.R. ABOVE, R.R. BELOW
- Ford, Dam
- Boundary lines: STATE, COUNTY, CIVIL TOWNSHIP
- School, Church, Cemeteries
- Boundary lines: RESERVATION, CITY OR VILLAGE
- Forest fire station, Airway beacon, Oil or Gas tanks
- U. S. Township and Section lines, Recovered corners
- Mine or Quarry, Rock outcrop
- Transmission line, Boundary monuments
- Soil boundaries, Stony, Gravelly and Cherty areas

RELIEF
(Printed in black)

- Mountain peaks, Escarpments

DRAINAGE
(Printed in blue)

- River, Springs, Wells
- Lake or Pond
- Intermittent streams, Perennial streams
- Swamp

SPECIAL SYMBOLS

XX—Extremely stony, cherty, or gravelly

ACCELERATED EROSION
- S—Moderate sheet erosion
- SS—Severe sheet erosion
- G—Moderate gully erosion
- GG—Severe gully erosion
- SG—Moderate sheet and gully erosion
- Gully

SINK HOLES AND DEPRESSIONS
- Difficult to cultivate across

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